

COST OF DIET ASSESSMENT IN GAO REGION OF MALI

TARKINT AND TÉMÉRA LIVELIHOODS ZONE

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A Save the Children UK methodology



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Executive Summary

Introduction

A COD assessment was planned in the Gao district and specifically Tarkint and Téméra livelihood zones to accompany an HEA assessment carried out in the same livelihoods zones. In order to understand better the food security situation within the area and gain a more accurate and informed understanding of the barriers, particularly economic which are preventing household from accessing a sufficient and adequate diet. Understanding the seasonal impact of food availability and fluctuating food prices is vital at a time when the population is increasingly vulnerable as a result of external factors such as the global food price rise, climate change and desertification. This assessment will form part of a wider body of evidence to inform programme planning interventions in the area.

Method

A core team from Temera and Tarkint was brought to Bamako for training on the CoD assessment. Based on the HEA assessments, sites were selected to represent the places where households purchase their food most commonly. The focus was on the poor and very poor. A list of available foods was drawn up and the seasonal availability was established.

The teams went out to the livelihood zones and three sets of data were collected:

- 1) Price data for all available foods
- 2) The weight of each food item in the unit in which it was sold
- 3) Normal food consumption patterns; the frequency with which different foods are consumed when they available.

The data was entered back in Bamako and a consolidation exercise took place in order to establish final availability and a price per 100g for each food item.

Analysis

There are three stages to the analysis ;

- i) Tier 1 – The lowest cost diet which meets all energy, micro and macro nutrient requirements is calculated. There are very broad limitations on the amounts of foods which can be included into the diet which means the results can sometimes be based on diets which could not reasonably be consumed.
- ii) Tier 2 – the lowest cost diet which meets all energy, micro and macro nutrient requirements is calculated however this time the foods which can be included into the diet are restricted to reflect more closely the actual food consumption patterns.
- iii) Scenario Modelling – this takes the results from tier 2 and models different scenarios or potential interventions in order to explore the impact this has on the cost and quality of the diet.

Tarkint Results

The results from Tarkint show that the foods available to the poorest household are insufficiently diverse enough to provide an adequate quality of diet. The lowest cost of diet using tier 1 is unaffordable by the poorest and affordable for all other wealth groups however this diet does not meet all the micronutrient requirements for any wealth group.

Tier 1 Tarkint	Annual CoD (CFA)	Annual Income (CFA)
Very Poor	654757	385785
Poor	895640	1045812

Middle	1169403	2461582
Better Off	2294566	3209597

The diet of the 12 – 23 month old using Tier 1 analysis was unable to meet the following requirements, highlighting the risk to the most vulnerable member of the household.

	Cold	Hot	Rainy
Zinc	100%	94%	100%
Iron	35%	42%	35%
Vitamin B1	82%	76%	82%
Vitamin B6	60%	73%	60%
Folic Acid	96%	97%	96%
Vitamin C	89%	81%	89%

The diet for the rest of the household was better however still unable to meet vitamin C and folic acid requirements in all seasons. The diet was substantially more expensive in the hot season than in the rainy and cold seasons and also of poorer quality.

During the tier 2 analysis (where diets are restricted by realistic food consumption patterns) the diet quality was even more limiting. The scenario modelling demonstrated that with increasing the availability of certain food items into the diet the quality of the diet could be improved to meet requirements. Firstly locally available foods were included such as mutton and sardines to try and improve the availability of iron, zinc and B vitamins in the diet. Fruits which could be imported from other parts of Mali were also included in order to improve the quality of vitamins A and C into the diet. By using foods available locally and imported fruits alone however was still not sufficient to meet all the requirements of a household.

In order for the diets to meet all nutrient requirements, additional foods had to be included from nearby Temera, Gao and some from Yorosso. These food namely, papaya, jujube, green leaves, liver and dried fish all had a positive impact n the diet especially during the hot season. The cost of these diets, however are based on the cost of the food items within Temera / Gao and Yorosso and therefore additional costs for transportation would have to be included.

The daily cost of diet (CFA) when all nutrient requirements are met for the poorest households

	Cold	Hot	Rainy	Annual
Daily cost of diet	1151	2515	1241	598,654
Daily income (average)	1057	1057	1057	385,785

Another method by which to improve the diet quality is through the inclusion of specially fortified foods such as plummy doz or csb plus plus, the diet quality is improved so that almost all (above 95%) requirements are met. The fortified foods were included into the analysis as a free food item as would happen during a distribution and therefore the cost of the diet in the hot season was reduced.

Tarkint Discussion

The results from Tarkint highlight the issues of diet quality as well as affordability. There are simply insufficiently diverse foods available for household to purchase. The situation is exacerbated in the hot season when there is a lack of milk. During the milking period the diets of all members of the household are significantly improved. There is a system of support where the richer households support them either through the giving of surplus milk or the loaning of animals to herd. If the community experiences a shock and this balance is upset and livestock is sold this will have an effect

not only on the animals owned by the poor but also on the assistance they receive. The nutrition data from the region reinforces the findings that there is a seasonal hunger gap. Improving the availability of fruits such as mango and papaya will provide core nutrients such as vitamins A and C, a deficiency of these nutrients will have a negative impact on the health of communities within the zone. However one strategy standing alone such as this will not be sufficient. Although food assistance and the distribution of fortified products could be a viable intervention there are several limitations regarding the acceptability by the community of unfamiliar foods as well as a lack of sustainability. The food insecurity in the zone is a long term issue which requires a long term dual purpose solution which tackles not only the issue of affordability but also the quality of the diets available.

Tarkint Recommendations

Short term approaches such as the distribution of food, fortified foods or supplementation can be utilised to manage the acute situation however a long term and sustainable approach must be researched and developed which tackles not only the issue of variable diet quality but also addresses the deficit between the cost of food and household income. Protection of livelihoods and increasing household income should be combined with strategies to improve food security, nutrition and health by ensuring the continuation of income generation activities as well as enabling the availability of milk within the household, providing an essential source of energy and micronutrients.

Téméra Results

The tier 1 results show that the lowest cost diet which meets all the requirements for all members of the household is unaffordable when looked at with current income figures. The diets are marginally more expensive during the rainy season when we would also expect income to be lower than the yearly average. The tier 1 diets are calculated on the minimum cost of a diet which meets all the requirements however the foods are selected in unpalatable portion sizes and so the tier 2 analyses was done in order to base the cost on more realistic consumption patterns and in order to investigate and potential nutrient deficiencies in the diet.

	Annual CoD – tier 1 (CFA)	Annual CoD –tier 2 (CFA) Requirements not met	Annual CoD – tier 2 (CFA) Requirements met	Annual Income (CFA)
Very Poor	687,650	972,616	691,533	227866
Poor	1,038,078	1,528,441	-	382269
Middle	1,135,096	1,727,454	-	750392
Better Off	1,538,239	2,441,056	-	1294446

When the analysis is conducted using tier 2 and the diets reflect more realistically what households consume in more realistic portion sizes the lowest cost diet is unable to meet all the requirements. Vitamin C, vitamin A, folic acid and iron (12-23month olds only) and fat (family >2years only) are all problem nutrients.

By making some changes to the types of foods that are included into the diet the quality of the diet can be improved. The changes made were increasing the frequency that mango, guava and papaya were included, changing the sweet potato to the more vitamin A rich orange variety and increasing the frequency that fish, meat of eggs could be included. All micronutrient requirements were met as a result of these changes. Especially significant were the inclusion of the orange variety of sweet potato and the inclusion of mango, papaya

Although the quality of the diet increased so did the lowest cost. The results for the poorest households were used to highlight this as the results for the poor and the very poor households followed the same pattern.

Téméra Discussion

The current levels of income which all wealth groups experience are not sufficient to afford a nutritious diet as shown by the tier 1. However when the lowest cost is calculated based on what is currently being consumed there are deficiencies in micronutrients.

There are limited food types available in the local stores which households use most frequently however a slightly wider range of foods available in the main market of the zone (Téméra). Even though these foods are largely unaffordable to the poorest households it does demonstrate that foods are reaching the zone.

The scenario results demonstrate that it is possible to increase the quality of the diet by increasing the frequency that different foods are consumed and by including foods which are available within the zone or in Gao market (which is frequented by some households within the zone). The cost of the diet which is based on more realistic consumption patterns and which meets all requirements is still unaffordable. In order to estimate the cost of a diet which meets all requirements the diets are no longer based on the usual consumption patterns but rather what could be and would need to be consumed in order to fulfil all dietary requirements.

Téméra Recommendations

Through a combination of economic intervention and behavioural change households in Téméra could improve the quality of their diets. However it appears that the economic constraints on households mean that there is little demand for more diverse foods.

Agricultural diversification could offer an opportunity to widen the availability of certain more micronutrient rich foods for example the production of orange sweet potato instead of white. Preparing households for the lean period, increasing income through cash transfer of cereal banks may be one avenue that warrants exploring especially for those households for which physical access becomes an additional barrier during the rainy season.

Overall conclusions for Gao district

Temera and Tarkint have very different issues when it comes to accessing a sufficiently adequate diet throughout the year. What these results do show however is that it is an issue of both affordability and quality and therefore any intervention needs to approach both of these aspects in unison.

An intervention must ensure that there is an increase in the availability of a more diverse range of foods. The data collected shows that fruits such as mango and guava are available in Gao market and therefore market interventions which allow them to be available in the more rural market places of Temera and Tarkint should be encouraged.

An intervention which optimises the assets of Temera and Tarkint should be explored. Encouraging trade between the two zones in order to take advantage of stock and surplus is one way in which income opportunities can be increased as well as increasing the availability of more diverse foods within the zone. For example; The sale of milk products from Tarkint in Temera and the sale of dried fish from Temera in Tarkint. A sensitisation element to the programme may also be necessary, especially in Tarkint where the diversity of foods available has been very limited and foods such as fish have not historically been well accepted.

Taking this forward the results can hopefully inform the direction that any intervention takes in the region. Consolidation with the communities in order to design and promote an effective strategy is essential in order to assure that any intervention is well accepted. The cultural context surrounding

food, what people chose to eat and how is well established and any food based intervention has to be well accepted to ensure success. Sustainability of any intervention must also be considered. Short term approaches may provide a relief during the hunger season however without a long term approach household will become more vulnerable for longer periods of time as they have to resort to detrimental coping strategies such as the sale of assets.

Now that there is some knowledge and experience of CoD within the teams across many different partners, the methodology can be used in an ongoing fashion to assist in the monitoring of the food security situation. With monthly or seasonal data collection a more accurate and current picture can be built up. The vulnerability of household to food insecurity is highly dependant on the increasing food prices, with ongoing collection of this data the results can feed into an early warning system which can alert a well informed response.

What foods could be the focus of market interventions to improve the diversity of the diets available locally?

From the analysis we can already see that there are some foods which are available but not currently eaten. As the levels of income are already less than the cost of the best possible diet, one that doesn't meet all the requirements, any behavioural change intervention aiming to improve diet quality needs to be accompanied by assistance to help households afford the more nutritious foods or they foods themselves have to form part of an intervention such as a distribution of free foods. Outlined below are is an overview of the foods which if more available to households, and included into the diet, would have a positive impact on the micro and macronutrient content of the diet.

Tarkint

The foods which are currently available locally and could be included in this are:

*Canned sardines
Animal meat
Powdered Milk
Dried Fish from nearby Temera zone.*

Foods which are available within Mali which may improve the quality of the diet if included are :

*Mango
Papaya
Green leaves (Baobab or pumpkin)*

Further research should be encouraged as to the efficacy of including unripe, ripe or dried fruit.

Temera

The foods which are currently available locally and could be included into the diet are:

*Meat products
Exchanging purple/white sweet potato for orange sweet potato
Legumes (beans)
Fonio
Cram Cram*

Foods which are available in nearby Gao which may improve the quality of the diet if included are :

1. Introduction

1.1 Background

Oxfam has been working in the Circle of Bourem which covers the communes of Tarkint and Téméra since the extensive droughts of 1983-84. The programmes have included areas such as education, food security, governance, water, sanitation and hygiene. The recent droughts in the region have demanded a more urgent response and in September 2009 a food security and livelihoods emergency response was implemented in order to support households during the hunger gap which was estimated to be worse than previous years due to poor rainfall and the resulting high loss of livestock. The response comprised of a one of distribution of food, animal fodder and cash to the poor and very poor. Research to inform the design of potential strong food security and livelihoods programming is being carried out by Oxfam GB. In September 2009 an HEA assessments was carried out in Tarkint and Téméra to gain a better understanding of household's economy, their vulnerability to food insecurity and malnutrition and the overall food security situation in the Circle of Bourem. The Cost of Diet assessments in the same zones will compliment the information in order to assess the availability of a nutritious diet and a household's ability to afford it. The two livelihoods zones¹ which are the focus of the HEA and CoD assessments are Tarkint and Téméra. Tarkint is defined as a *pastoralist* livelihood zone and Téméra as an *agro-pastoralist*. Ad hoc findings during recent rapid assessments and observation and discussions during the recent distributions and evaluations show that a lack of water and good pasture as caused household to travel further than normal to look for water as well as using fixed water points in order to provide water for animals, labour migration is also taking place for longer periods of time². More detailed information regarding the features of the livelihood zones and HEA results can be found later in the report.

¹ A livelihood zone can be defined as an area within which people share broadly the same pattern of livelihood; that is broadly the same production system -agriculture or pastoralism for example - as well as broadly the same patterns of trade/exchange – Taken from HEA a practitioners guide, Save the children UK

² Emergency response to the drought in Gao, Mali, Monitoring report by Oxfam GB, October 2009

1.2 Nutrition Indicators³

The nutrition indicators in table 1⁴ (secondary source) show an overview of the nutrition situation in both livelihood zones. These are nutritional indicators for children under the age of 5 and are internationally recognised as an indicator of the nutrition situation of the population as a whole. The survey was carried out at 2 points in the year; July which is just after the lean period and March which is at the beginning of the lean period. This therefore shows us the nutritional situation at the it's worse, after months of food insecurity (July) but also we can see how it changes throughout the year and what levels of undernutrition we would expect to find at the more food secure times of the year (march). The wasting or acute rates of malnutrition are according to the WHO classification high during the lean period. Prevalence of wasting in Téméra is of medium severity during the non lean period whilst is seen to be low during the non lean period in Tarkint. Wasting is an indicator of short term of acute undernutrition and therefore can be used as an indication that household are experiencing short term food insecurity during these periods.

Stunting is an indication of long term of chronic undernutrition and signifies that household have experienced sustained food insecurity and that children have been receiving in adequate food intake from an early age. The long term impact of chronic undernutrition from a young age is that usual growth and development does not take place and children are less well protected against infection and illness. Underweight is an indication that a child might be either chronically or acutely malnourished and the indicators show that the levels of underweight children are high according to international standards.

Table 1 Under 5 nutrition indicators for Tarkint and Téméra

		Tarkint	Téméra
Wasting (<-2 z scores)	July 2007	12.7 %	10.7%
	March 2008	1.0 %	5.8 %
Stunting (-2 z scores)	July 2007	20.4 %	26.9 %
	March 2008	15.9 %	24.1 %
Underweight	July 2007	24.7 %	29.1 %
	March 2008	12.0 %	20.3 %

2. Method

The CoD is an assessment and analysis tool, a linear programming model built into Microsoft excel which can identify the gap between income or food expenditure and the lowest cost of a diet which meets all the energy and nutrient requirements of a household.

In order to use the CoD programme a list of locally available foods is required (foods available in the markets visited by the poorest households), and the seasonal variation in availability and cost of these food items. The programme uses the food list combined with information detailing a family's food consumption patterns to calculate the cost of a diet to meet the energy and nutrient requirements of a user defined household. The CoD programme minimises the overall cost of the diets selected; thereby producing results which show the lowest cost of a diet which meets all the micro, macro and nutrient requirements of the household.

The diets selected have to respect user defined "constraints". These constraints are food pattern descriptions which are used for a variety of purposes: To ensure that sufficient breast milk is

³ Système d'Alerte Précoce, Etude de Base de la Sécurité et de la Nutrition (EBSAN) Mars 2009, Data from July 2007 and March 2008, UNICEF, WFP, HKI

⁴ Système d'Alerte Précoce, Etude de Base de la Sécurité et de la Nutrition (EBSAN) Mars 2009, Data from July 2007 and March 2008, UNICEF, WFP, HKI

included into the diet of a breastfed child, to prevent the results from including quantities of foods which could not be feasibly consumed; 1 kg of spinach per day for a 12 – 23 month old for example, or to prevent food items from being included into the diet more frequently than could be expected to be eaten, for example eggs 3 times per day.

The results from the CoD program are then reviewed alongside income data collected during the HEA assessment in order to be able to better understand and make estimations regarding the capacity of a household to afford a sufficiently nutritious diet.

The CoD tool has been developed to allow 2 levels of analysis which are outlined below. The analysis for this study used both Tier 1 and 2 tiers.

2.1 Tier 1

Tier 1 analysis is the most basic analysis, where the results show the lowest cost of a nutritious diet. The food pattern constraints (as described above) are less specific and only restrict the portion size of each food allowed. The maximum portion sizes are determined by the overall contribution to the total energy made by each food group, the breakdown of which can be seen in annexe 1. The maximum portion sizes are often very large⁵ and therefore allow an unpalatable amount of food to be potentially selected. This means that the lowest cost of a nutritious diet could be based on a diet which could not be feasibly consumed by all members of the household.

Limited data is required to conduct tier 1 analysis in comparison to tier 2 and the results are a good indication of the overall availability of a nutritious diet using only locally available foods, as well as the lowest cost. The results can be used for developing advocacy messages around availability, cost and affordability.

2.1.1 Tier 2

Tier 2 analysis requires more detailed data concerning food portion sizes, frequency with which different food items are consumed, and the regularity with which foods from different food groups are consumed, in order to inform the user defined food pattern constraints. This enables a diet to be selected which more appropriately reflects the dietary patterns of the local population, and therefore gives more realistic results; the lowest cost of a diet which meets requirements *and* can be consumed as part of a usual Malian diet. The results of tier 2 analysis can also be used for advocacy purposes, as well as being used for helping to design programme intervention. Different scenarios can be modelled using tier 2 in order to explore the impact on cost and diet quality that an intervention such as supplementation, food rations, or behaviour change might have.

The results of either tier 1 or 2 can show either of the following two scenarios:

- 1) The lowest cost of a diet which meets all the requirements for all members of the household

Or

- 2) The lowest cost of a diet which doesn't meet all the requirements. The cost would be based on the best possible diet that can be selected from the foods available when the portion size and frequencies are constrained by realistic or current eating patterns. These results would highlight potential patterns of nutrient deficiency, that is nutrients which may be lacking in the diets

⁵ For example 1154g of potato per day is the maximum amount which can be included into the diet for a 12 – 23 month old.

of the local population. This may be due to a lack of availability of diverse nutrient dense food items or that the diets which are commonly consumed do not include nutrient dense foods.

If the results fall under scenario 2 this would indicate that there are potential patterns of nutrient deficiency within the population, or that adequate intakes of certain micronutrients may be difficult to achieve from a locally available diet. This would inform the direction of any planned programme intervention to look not only at access in terms of affordability, but availability of nutrient dense foods at the individual and household level.

The CoD programme can then be used to model the impact of potential interventions such as supplementation or increased consumption of certain foods in order to explore the impact this would have on diet cost and quality.

Two databases are used within the programme;

- 1) A database of nutrient and energy requirements based on age, sex and activity level taken from WHO/FAO 2004 nutrient requirements database⁶.
- 2) A database of nutrient and energy content of food items taken from FAO Food composition database.

A focus on 12 – 23month olds

The CoD methodology has a special focus on the 12-23month olds. Before the age of 2 children are vulnerable to the long term effects of undernutrition yet this is also the time where catch up growth is possible and therefore if a population is experiencing food insecurity and malnutrition targeting children under the age of 2 years and improving their nutritional status will have a long term effect on the future health and well being of the population. The needs of the 12-23month olds are unique as they transition from breast milk to complementary foods. Continued breast feeding is still recommended but as they grow up and start to eat the same foods as the rest of the family their requirements for a diverse and micronutrient rich diet are higher, relatively than older members of the family.

2.3 Training

Due to insecurity issues in the region of Gao the original intention for the consultant to train all members of the data collection team in Gao itself wasn't possible. For this reason, an OGB Food Security staff and 3 representatives from Tarkint commune and from partner organisations GIDES and ATDS travelled to Bamako and took part in the training of trainers. They then became trainers themselves, thereby strengthening the capacity within their structure or organisations to carry out further CoD studies. The following training schedule was carried out in Bamako for the training of the trainers however the schedule followed in Gao for the training of the data collectors followed the same pattern.

The training took place over 3 days in the Yangon office and took the following structure:

Day 1

- Introduction to CoD
- Identifying markets
- Development of food list and wild food list
- What data and how to collect it
- Exercise in market (weighing and price) data collection

Day 2

- Pilot market data collection
- Finalisation of food lists and seasonality

⁶ WHO/FAO Vitamin and Mineral Requirements in Human Nutrition Second Edition, 2004

- Food Consumption Patterns Data Collection techniques
- Day 3
- Food Consumption Patterns Data Collection
- Household composition
- Training schedule and tools
- Training and assessment logistics.

2.4 Development of Food List and Units

Initial food lists were created during the HEA assessments and so this was used as a basis. The trainers then listed all additional foods which were available in the boutiques which had been previously identified. The food list had to have food items on it which were available to majority of the poorest households in the survey area.

The food list and units by which foods are most commonly bought was also agreed upon in the initial training and confirmed when the data collectors themselves were trained.

All the wild foods which are available for collection were also listed, the frequency with which they are collected and the approximate amounts which can be feasibly collected per household.

2.6 Sampling

The sampling for the CoD assessment builds upon the sampling that has already taken place during the HEA assessment. During the HEA assessments, a selection of 8 villages was conducted across the livelihoods zone. Altogether, they allow representativeness of the zone.

In order to collect data from representative markets across the zone a mapping exercise took part during the training to identify where the poorest households purchased the majority of their food. More detail on the sample selected can be seen in the individual Tarkint and Téméra sections.

A minimum of 35 households needed to be sampled across the area in order to collect food frequency data. The minimum required is 30 interviews so more were collected in order to be able to select the best data. At least 5 interviews from each site took place in order to capture sufficient data.

Further information about the sampling of sites within each livelihood zone is described in the Tarkint and Téméra sections of the report.

2.7 Data Collection and consolidation

The following data was collected for the analysis and can be grouped into 2 categories:

A. Market Data

1. Weight of food item as it is sold
2. Price of food item as it is sold

B. Food Consumption Pattern Data

3. Frequency that each food item is consumed by 12 – 23 months olds and if it changes for different members of the family
4. Frequency with which any food items from a food group are consumed by 12 – 23month

The data was collected retrospectively asking vendors the price per unit of each food item over the previous year and noting any periods where it changed.

The food consumption frequency data was also collected retrospectively.

The data was entered and the team leader from the assessment fed back to the Bamako team. In order for some of the qualitative information to emerge the team leader was fully involved in the data entry and analysis.

Consolidation of the food list whereby foods were only included if they were available in the majority of the markets, and therefore available to the majority of the households. Foods were included as the raw ingredient, meals or dishes even if they were purchased by households were not included.

The weight of the local unit of each food item (e.g. Kg, tas/pile) was consolidated, outliers removed and averaged in order to establish a weight in grams per local unit.

This then acted as a conversion figure in order to establish the price (in FCFA) per 100g of each food item.

In the region it is often not the price that changes as availability fluctuates but the amount which is sold. In order to try and capture this, the number of items sold in a pile, or how the size of the pile changes was recorded.

Consolidation then removed the outliers and an average price / 100g was established.

A lower and upper limit for the number of times any food item from a food group can be included into the diet was established by selecting the 25th and 75th percentile of the total range of frequency from the data that was collected. The foods are grouped by food type and in order to reflect the way in which the foods are eaten.

In order to establish a maximum frequency with which any food item could be included into the diet, the 95th percentile of the maximum times a food item was consumed (taken from the data collected) was used as the upper limit.

All lower frequency limits were set at zero, meaning the minimum amount of times a food could be selected is zero.

The limits are set at these percentiles rather than the average times consumed so as to avoid the upper limits acting as barriers to the optimal diet. They are used to guide the selection of food items to represent what could feasibly be consumed by a household rather than to represent exactly what is consumed.

The portion sizes that are used in the tier 2 analysis are generic portion sizes that have been collated from a range of secondary and unpublished data, largely from Indonesia. Had portion size data from Mali been available it would have been included but in the absence of this generic data was used.

The portion size data for 12 – 23 month year olds is used as the basis, these are scaled up as a proportion of energy requirements for all other family members (e.g. Provide an example).

The portion size data is to represent what is reasonable to expect an individual to consume.

2.6 Household size and definition of wealth group

The average household size varies in number and composition dependent on wealth group. During the training, there was a discussion amongst the project team as to what the most appropriate composition of the household was for each wealth group. This was confirmed during the Gao training as well. The detailed household compositions for Téméra and Tarkint are shown in the relevant sections of the report.

HEA Income Data

The income data used was collected during the HEA assessment and for reference year August 2007 – July 2008. The data collected for the CoD analysis however reflected the December 2008 – November 2009 reference year. In order to adjust the income data so that it could reflect more

appropriately what income households had to spend on food expenses during the CoD reference year a number of calculations were carried out.

- 1) All sources of income were adjusted to 2008/2009 figures by using a terms of exchange rate between goats and millet⁷.
- 2) All foods consumed that were produced by the household were converted into income as a cash equivalent.
- 3) All gifts, donations and payment in kind were converted into a cash equivalent using the local price of millet.

More specific details on the income calculations are within the Tarkint and Téméra sections of the report.

⁷ Monthly price data taken from Système d'Alerte Précoce

3. Tarkint

Tarkint livelihood zone

The commune of Tarkint is a pastoral area which lies north of the Niger River in the Tilemsi valley and isolated from the rest of Mali. The chain of hills, sand dunes, ponds and wadis makes the topography of the area. The vegetation consists of pasture and steppe semi-desert spiny. In normal years and good years there are seasonal ponds around which the population can grow sorghum. Wild food such as wild fonio, cram-cram and wild watermelon grow in normal year and can be consumed by poor households. The main inhabitants of this area and the subjects of this profile are Arab pastoralists and Tamachek which are divided into 36 fractions. The population density is very low. Means of livelihoods crucially depend on herds. The main types of animals in the area are camels, cattle, sheep and goats, although there have not many cattle north of the area. Trade is a secondary activity, but nevertheless important. The town is located on major roads, including sandy routes between Gao, Kidal and Tessalit-Khalil (the Algerian border) and the Trans-Sahara road.

The lack of economic diversity means that households are very vulnerable to risks that threaten the size and value of their herds.

Pastoralism is a word full of meaning. The long-term trends are still elusive. However, respondents in our interviews did not mention pastoralism in decline but rather a cycle of good years followed by bad years. The population of Tarkint speaks about change and adaptation. There is a type of settlement in the form of permanent sites with permanent buildings. However, this is a settlement-by-step and nomadism still continues in the restricted region as grazing land is not available all year around such alleged permanent sites.

3.1.1 Tarkint Market and Site Selection

It is understood that most household's in Tarkint zone visited local boutiques based within the sites⁸ in order to purchase food items as well as some foods being bought from passing caravans and trucks (Tarkint). Very few of the households were thought to travel to the larger markets of Djebok and Gao. As the focus is on the poor and the very poor households and these households buy the majority of their food locally that it would be these village boutiques which would be included in the sample. In order to include a representative sample from across the zone the CSAS (centric systematic area sampling⁹) method was used.

Table 2 Markets identified to visit for data collection in Tarkint

Places of purchase	Frequency of market/ shop	Frequency of visits by the population
Boutiques d'Almoustarat	Every day	Monthly / tri-monthly
Boutiques de Tarkhint	Every day	Monthly / tri-monthly
Boutiques Ersane	Every day	Monthly / tri-monthly

⁸ Sites is the term used to describe the village communities where the semi-nomadic pastoralists have settled

⁹ Centric Systematic Area Sampling (CSAS) – Using a map showing all villages and towns in the zone. A grid of equally-sized squares is then placed over the map. The number of squares in the grid should equate to the number of sites from which data will be collected. The location of each data collection site is then the village or town nearest the centre of each square.

Boutiques Tabankort	Every day	Monthly / tri-monthly
Boutiques Chinkaye	Every day	Monthly / tri-monthly
Boutiques Kirchoueil	Every day	Monthly / tri-monthly
Boutiques Agamhor	Every day	Monthly / tri-monthly
Travelling merchants / caravans from Algeria	Unknown	Unknown

3.1.2 Household size - Tarkint

Table 3 provides an overview of the number of people in the average household by wealth group as well as some details on livestock assets. This information was used to assist in the identification of the poor and very poor households for inclusion in the frequency interviews.

The household composition is intended to give an approximate estimation of the number and ages of children, adults in households in the zone in order to establish the total energy, macro and micro nutrient requirements during the analysis.

Table 3 Usual Household Composition

	Number of people in household	Average Household composition	Livestock
Very Poor	5 – 7	<ol style="list-style-type: none"> 1. Man 30 - 59yr 2. Woman 30 - 59 yrs 3. Child 10 - 11yrs 4. Child 8-9 yrs 5. Child 4 – 5 yrs 6. Child 12 – 23m 	9 – 11 goats 0 – 2 donkeys
Poor	7 – 9	<ol style="list-style-type: none"> 1. man >60 yrs 2. man 30 - 59yrs 3. woman 30 - 59 yrs 4. child 11 – 12 yrs 5. child 9 - 10 yrs 6. child 7 - 8 yrs 7. child 5 - 6 yrs 8. 8child 12-23m 	5 – 7 sheep 14 – 16 goats 1- 3 donkeys
Middle	10 – 12	<ol style="list-style-type: none"> 1. man 30 - 59yrs 2. woman 30 - 59 yrs 3. woman 18 - 29 yrs 4. Man 18 - 29 5. child 17-18 yrs 6. child 15- 16 yrs 7. child 11-12 yrs 8. child 8 - 9 yrs 9. child 5-6yrs 10. child 12-23m 11. child 12-23m 	24 – 26 camels 9 – 11 cattle 35-45 sheep 30-40 goats 3-4 donkeys
Better Off	17 – 19	<ol style="list-style-type: none"> 1. man >60 yrs 2. man 30 - 59yrs 3. man (domestic/herder) 	45 - 55 camels 24-26 cattle 60 – 80 sheep

		30 - 59yrs 4. woman 30- 59yrs 5. woman (domestic/herder) 30- 59yrs 6. woman 18 – 29yrs 7. woman 18 – 29yrs 8. child 16-17 yrs 9. child 14-15 yrs 10. child 15-16 yrs 11. Child 10-11yrs 12. child (domestic/herder) 8 - 9 yrs 13. child 8 - 9 yrs 14. child 4-5yrs 15. child (domestic/herder) 4- 5yrs 16. child 4-5yrs 17. child 12-23m 18. child 12-23m	30- 40goats 7 - 9 donkeys
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3.1.3 Seasonality – Tarkint

The seasonal calendar below highlights the long lean period that households in Tarkint experience from March to June which is dependant on the rain fall. In a ‘normal’ year the availability of water lasts until the end of February however if the rainy season is shorter than normal as has happened in recent years, the lean season starts much sooner. If water is available for a shorter period of time the pasture is affected and the season of milk production also shorter.

The season when animals are most vulnerable to disease also falls within the lean period which puts an extra burden on household income and milk future production which will have a negative impact on the diet. A decreasing amount of fertile pasture as resulted in animal migration and has also impacted on the semi settled agro pastoralists and those groups within the household which remain settled at the sites whilst others follow the herd.

Figure 1 Seasonal Calendar

	Jul	Aug	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Seasons	Rainy				Cold				Hot			
Milk production	Camels											
Milk production									Cow			
Milk production		Shoats										
Animal migration												
Sale of animals					All animals		Camels					
Wild Foods												
Lean period												

For full HEA seasonal calendar see annexe 1

The seasonal breakdown used in the CoD analysis followed the climatic calendar and the reference year used was December 2008 to November 2009

3.2 Tarkint Results

Income

Table 4 gives an overview of the income figures that are used in the calculations of affordability. The *Total Income* figure for 2008 / 2009 is adjusted figure based on the HEA income data from reference year 07/08.

As previously explained because households consume food which they do not purchase, it is produced by the household or received as a payment in kind, this needs to be accounted for as part of the total income. It is therefore converted into a cash equivalent by using the market value.

The income generated in 07/08 was adjusted to reflect 08/09 income by using the goat to millet terms of trade as conversion factor. All kilocalories consumed as a result of payment in kind (food received instead of cash income) was converted into cash income by using the local 08/09 price of millet. All foods which were produced by the household and consumed, therefore not bought were converted into a cash equivalent using the average annual 08/09 market price. For example all butter produced and consumed by the household was converted into cash equivalent using the local price of butter and added on to the income of the household.

In Tarkint this applied to meat and butter products but not to milk as there is no market value for milk. Instead milk was included into the final food list as a free item.

We need to use an income figure which accurately represents the actual amount of money which is available by the household to spend on food. Households have much other expenditure such as household items, school feed, health fees etc meaning that not all income can be spent on food. In order to account for this the percent of income which was spent on non food items in 07/08 was calculated and removed from the income¹⁰ for 2008/2009.

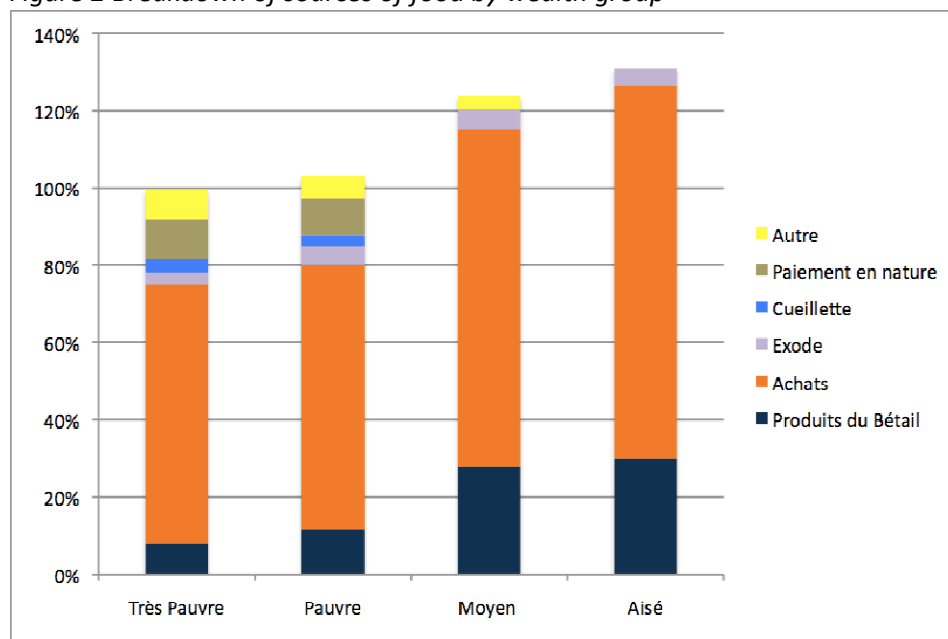
Table 4 Overview of HEA results and income figures used

	Very Poor	Poor	Middle	Better Off
Total Income 08/09	454996	1153148	3454015	5365331
Cash equivalent	216338	806903	1950329	2099068
% of 07/08 income spent on food	29%	31%	66%	66%
Amount Available for food purchase	385785	1045812	2461582	3209597

Figure 2 is taken shows the results of the HEA assessment and the main sources of food. It is clear from these results that for all wealth groups but especially the very poor (*tres pauvre*) and poor (*pauvre*) where over 60% of all food consumed in the household is purchased. This means that these household are vulnerable to the increasing food prices as has been seen in the areas in recent years as well as fluctuations in the household income and their earning capacity.

¹⁰ The non food expenditure was removed from the income figure before the cash equivalent was added.

Figure 2 Breakdown of sources of food by wealth group¹¹



3.2.1 Tier 1

These results explore not only the lowest cost diet but also issues of diet quality and whether the food items available for household to purchase in Tarkint are able to provide sufficient levels of micronutrients. In order to highlight the cost of the diets the poor and the very poor have been shown. The costs of the diets are also shown by season to highlight the seasonal variation in cost and availability of food items.

When the CoD analysis was conducted using tier 1¹² a diet which met all the micronutrient requirements could not be used in all seasons. The lowest cost of a diet therefore is the lowest cost of the best possible diet but is not a nutritiously adequate diet.

Even though this is the case, the income of the poorest is not adequate to cover the cost of the insufficient diet (figure 3).

Figure X shows that for the very poor households, the cost of the diet increases substantially during the hot season. The same trend can be seen for all households.

Milk has been included as a *free food item*. There is no cost attached to milk because it is not available to purchase on the market. However households have access to milking animals and therefore can access milk during the milking season (rainy season). During the analysis it is therefore made available during the rainy season only. The poorest households may have their own animals to milk but also receive small animals (goats and sheep) on loan from the wealthier household. They are responsible for the herding of these animals and then can also drink the milk. The poorest households also receive free milk from the wealthier households when they are experiencing a surplus.

¹¹ Autre:other, Paiement en nature: payment in kind, Cueillette: wild food collection, Exode: seasonal migration, Achats: purchases/expenditure, Produits du bétail: livestock products, Très pauvres: very poor, Pauvres: poor, Moyen: middle, Aisés: rich

¹² Tier 1 – when the maximum portion sizes used are calculated automatically and therefore can often be unfeasibly large

Table 5 and figure 3 shows the annual cost of diet of a tier 1 diet alongside the annual, adjusted income. Households which fall into the very poor category do not generate sufficient income to cover the lowest cost of the diet. The poor households are only just able to meet the lowest cost of the diet. **However these results show that the lowest cost diet does not meet all the micronutrient requirements.**

Table 5 Overview of results

	Annual CoD (CFA)	Annual Income (CFA)	% increase in income required
Very Poor	654757	385785	70%
Poor	895640	1045812	-14%
Middle	1169403	2461582	-52%
Better Off	2294566	3209597	-29%

Figure 3 Annual CoD and Income by wealth group

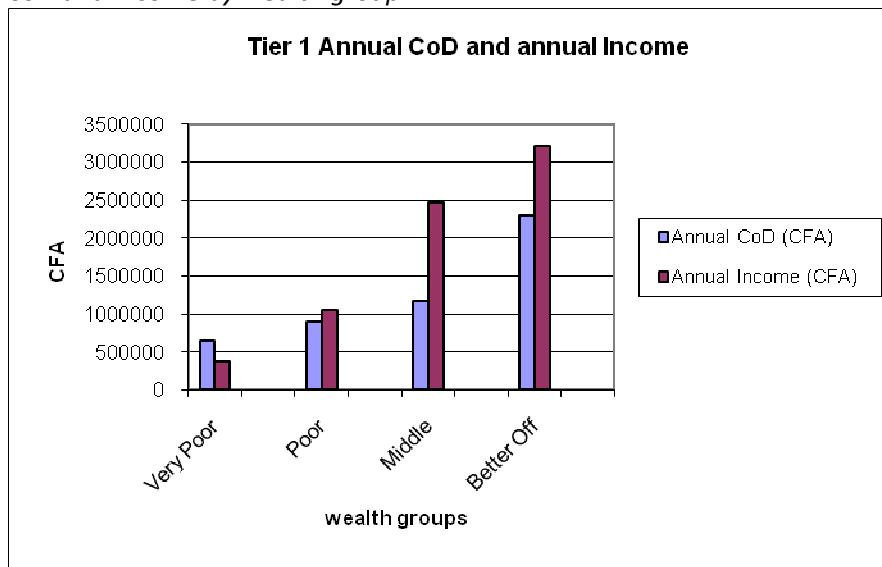
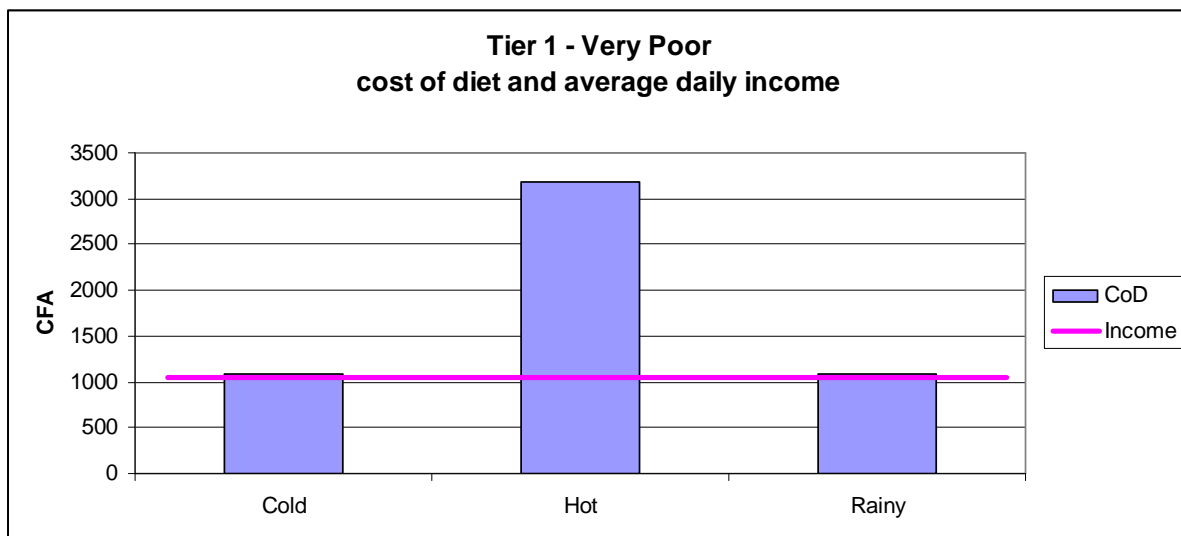


Figure 4 Seasonal CoD for the very poor



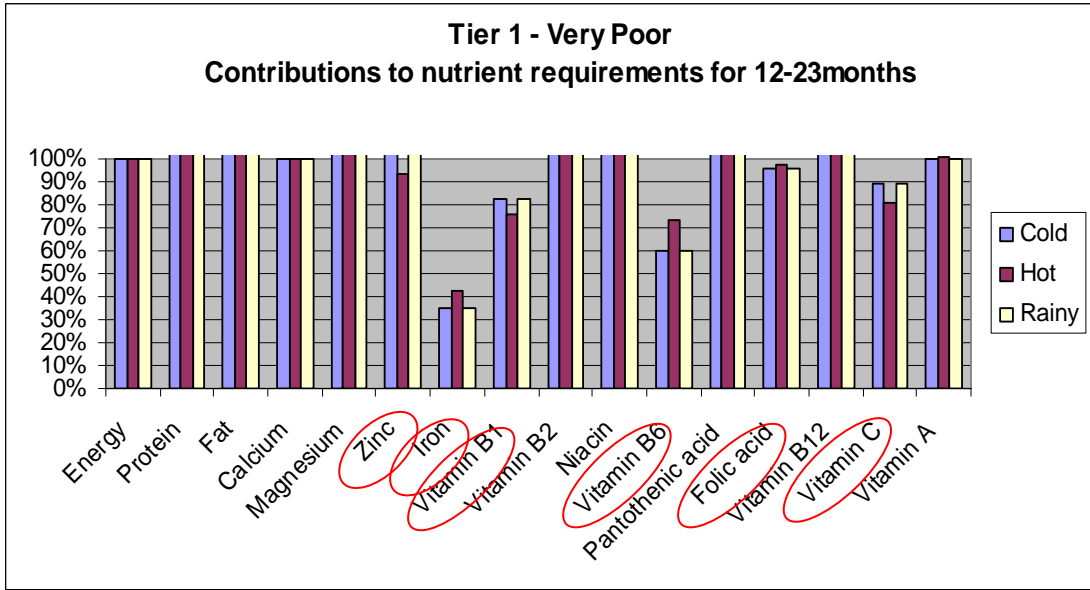
Figure's 6 and 7 demonstrate the quality of the diets by season. It is clear that for the 12 -23 month old zinc, iron, B12, B6, folate and vitamin c are all micronutrients which are potentially lacking in the foods available. This was the situation for the diets calculated for all wealth groups.

The tier 1 diet which this cost is based upon is indicating that there are certain nutrient requirements which are difficult to meet within the locally available foods. When the diets are looked at more closely (table 2 and 3) we also see that it is not a diet which could be usually consumed. Although there is a heavy reliance on milk in the area in order for a diet of this quality to cost this amount a household of 6 (using the example of the very poor) would have to consume over 9200 grams of camel and buttermilk per day as well as 216g of powdered milk in the cold season.

However, we know for the HEA analysis that the poor and the very poor households do not consume camels milk. They consume sheep and goats milk but this a mass' to only 1274g per day for the very poor household of total milk consumption. Therefore this raises the question of whether families would be able to access this level of free milk and the implication of this is that a diet is likely to be of even more limited quality.

We are considering a very poor household to highlight the case and we know from the HEA study that a very poor household would expect to produce approximately 1110g milk per day so it is unlikely that a household would be able to even access the quantity of milk which would be required to meet the requirements in this manner. In the tier 1 analysis, the cost of milk is given as free but the maximum times which it can be consumed is not restricted which means that large quantities can be included in the diet, keeping the costs down whilst being able to include large portions of a nutrient dense food.

Figure 5



The nutrients which are circled in red are not met by the very poor aged 12 to 23 months.

Figure 6

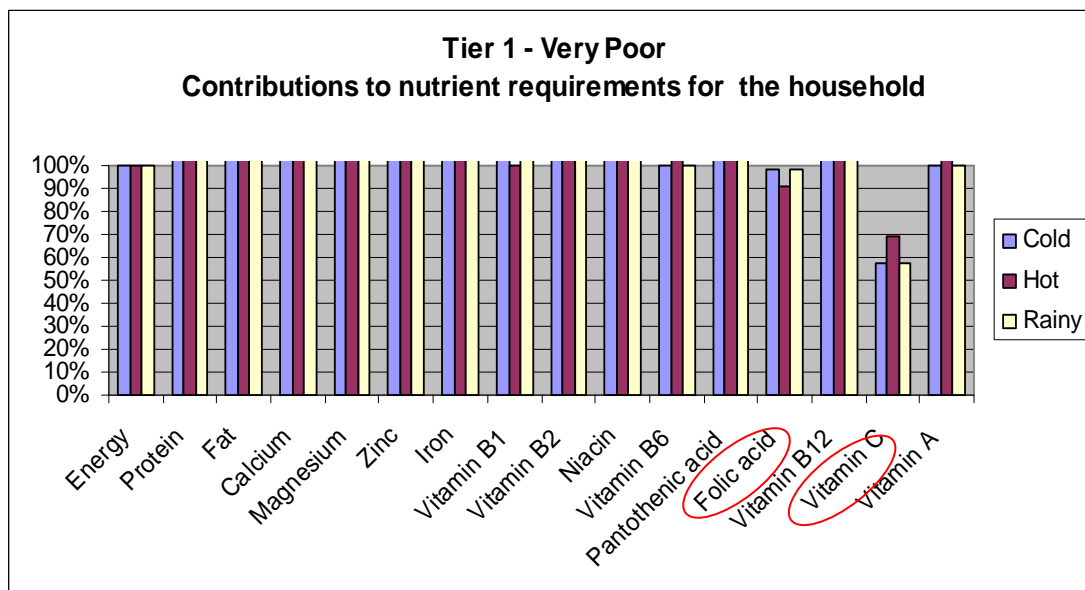


Table 6 The best possible, lowest cost diet selected using tier 1 for 12-23month old for the very poor wealth group.

	Cold	Hot	Rainy
	Grams / day	Grams / day	Grams / day
Beast Milk	549	549	549
Peanut	62	68	62
Milk - camel	131	0	131
Powdered Milk	0	31	0
Butter Milk	220	0	220

Table 7 The best possible, lowest cost diet selected using tier 1 for family >2years for the very poor wealth group.

	Cold	Hot	Rainy
	Grams / day	Grams / day	Grams / day
Peanut	914	914	914
Milk - camel	2131	0	2131
Powdered Milk	216	892	216
Butter Milk	6808	0	6808
Date	0	987	0

The following figures 7 and 8 highlight that issues of diet quality is not exclusively a problem for the poorest households demonstrating that it is a lack of diversity in the foods available that are preventing household from being able to access sufficient levels of micro-nutrients on a population scale.

Figure 7

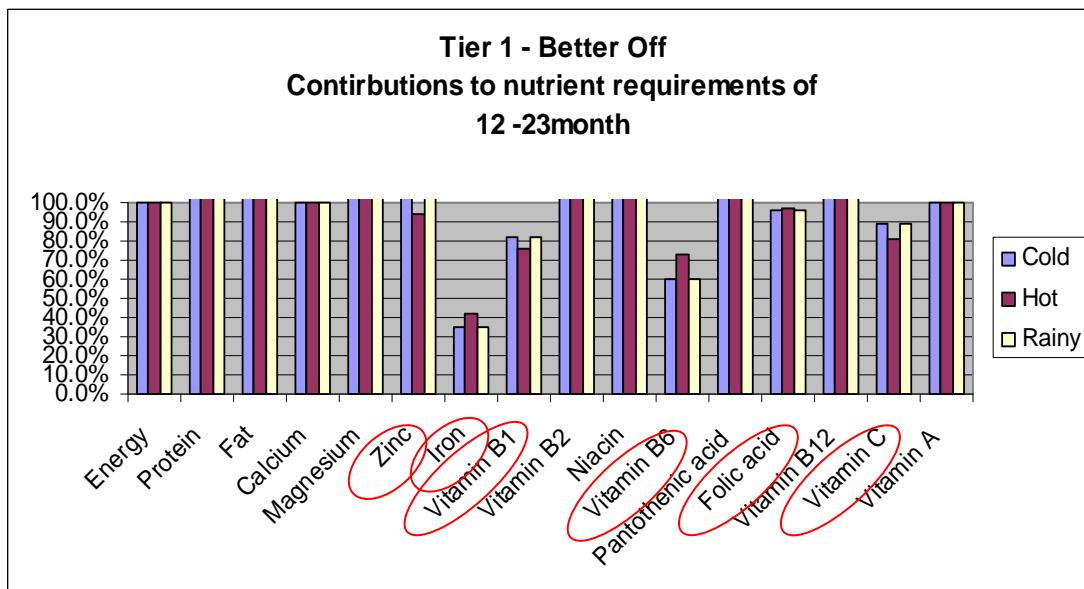
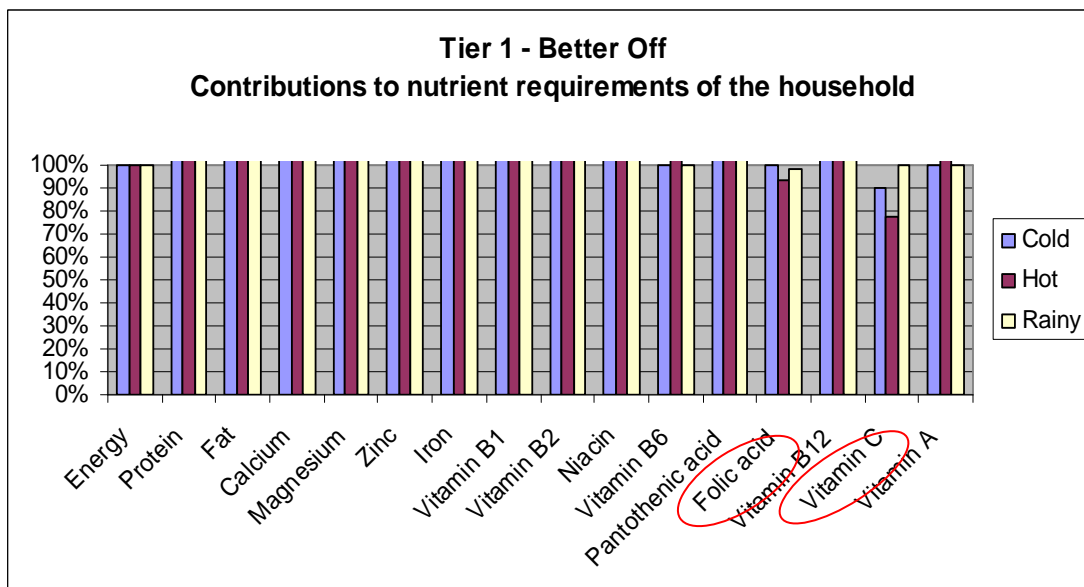


Figure 8



From the tier 1 analysis we can ascertain that the cost of the diet calculated in this fashion gives us a greater understanding about the quality of the diet than the cost. We know that the nutrient requirements of the household can only be met within an affordable range for the top 3 wealth groups however only with the nutrient dense food items being included in large quantities.

3.2.2 Tier 2

During the tier 2 analysis the frequency with which different foods could be consumed and the portion sizes were restricted to appropriately reflect the way in which they are currently being eaten. The programme is still run with the objective to find the lowest cost diet which can meet all the macro and micro nutrient requirements whilst still reflecting the patterns in which foods are currently being consumed. This analysis is run in order to eliminate some of the error caused by the inclusion of very large and unrealistic quantities. The results however further highlight the poor quality of the diet available and the diets consumed in Tarkint.

The frequency with which the different foods are consumed is shown in the annexe 2.

The results from this demonstrated that during the cold and the rainy season it is likely that households will struggle to access a diet which is sufficient in vitamin c, vitamin B6, vitamin B12, folic acid, pantothenic acid, calcium and iron as shown in figure 9. Yet during the hot season when the availability of milk is severely reduced and households are not able to consume milk as readily the list of problem nutrients is far higher. Sufficient energy, protein and fat in the diet to meet the requirement is not easily available, in fact according to the tier 2 analysis of the diet, according to how food was reported as eaten none of the requirements are met.

Further triangulation of these results needs to take place in order to explore the quality of the diets which are actually being consumed and the impact that this is having on nutritional status of households in Tarkint. Localised nutrition surveys conducted during different seasons as well as a more thorough diet recall survey would help to corroborate these findings. The CoD methodology collects diet consumption data in order to give a snapshot of the situation.

When the programme is forced to include foods which reflect what the population are eating the results show that insufficient energy would be provided in the hot season by the quantity and frequency with which foods are consumed. This is in line with the nutritional data which shows an increase in wasting and the prevalence of underweight during this time however there could be other explanations. The energy requirement is not being met but this may be because of an underestimation in the amount of cereals which are consumed. The amount of cereals consumed may increase in the hot season to compensate for a lack of available other food sources.

Figure 9

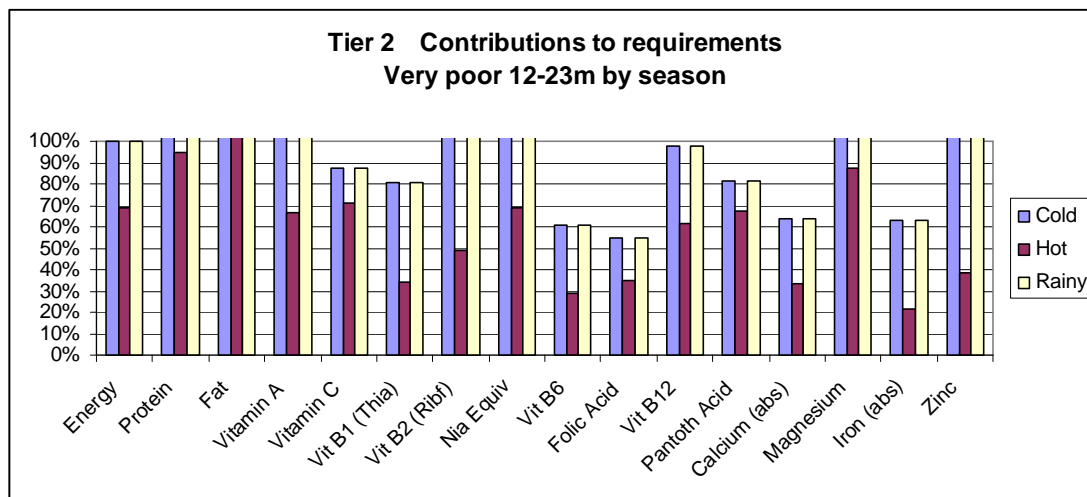


Figure 10

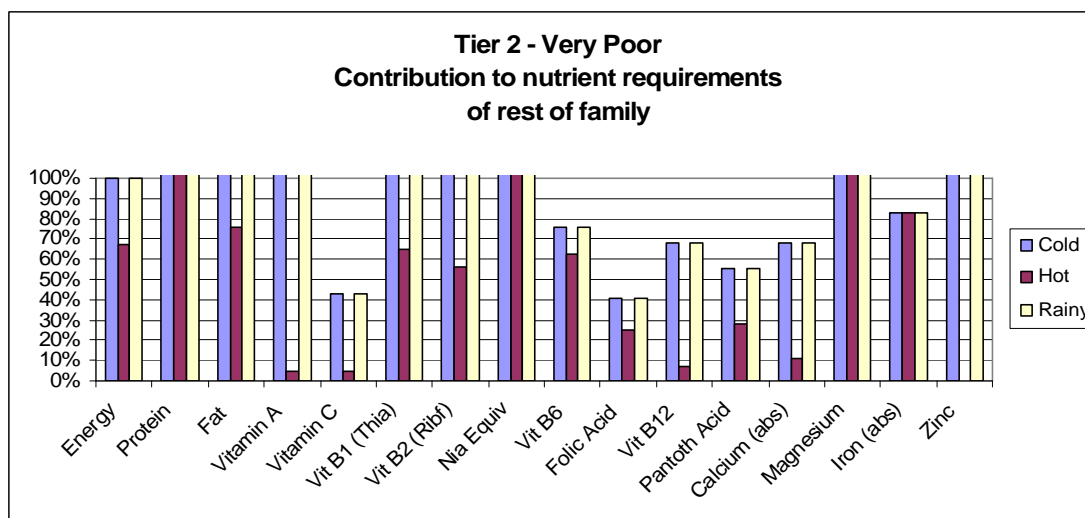


Table 8 Tier 2 total grams per day selected by the programme for the household

	Cold	Hot	Rainy
	Grams / week	Grams / week	Grams / week
Breast Milk	532	532	532
Rice	0	111	0
Millet	1332	15	1332
Semolina	0	79	0
Macaroni	102	102	102
Sunflower Oil	199	199	199
Milk (Goat)	387	0	387
Milk (Camel)	3382	0	3382
Buttermilk	1649	0	1649

Sugar	28	28	28
Mutton	43	43	43
Dates	120	0	120

The impact of milk on the quality of the diet in Tarkint is very clear. When it is available in the cold and rainy season household is more able to meet a wider range of macro and micro nutrients. For the 12-23month olds zinc is often a lacking as the amount provided by breast milk is no longer sufficient, however the high level of milk which is consumed means that zinc intake is sufficient amongst this population which is often not the case in areas of food insecurity.

It was not found that the eating patterns varied greatly between members of the household. Generally all members of the household ate food served from the same pot. It was reported that the child aged 12-23month consumed more frequently than the rest of the family but generally that their daily portion was spread out of more meals within the day.

Tier 2 analysis with maximum frequency of 3 times per day

As the tier 2 results have so far shown us that diet quality is insufficient in the way it is currently eaten the next stage of the analysis is to explore what impact improving the way and the types of foods people are consuming would have on diet quality. This is not the way foods are currently consumed which is likely to be due to cost, this analysis is to demonstrate if households ability to afford to eat 3 meals a day what is the impact on the quality of the diet.

The results of the analysis of the very poor household are shown to highlight this.

If each food item is allowed to be consumed 3 times per day, and any food item from any food group consumed during these 3 times per day (in accordance with 3 meals per day) the following results show the lowest cost and best possible quality of diet.

The portion sizing is still restricted to the estimated portion sizes (as opposed to tier 1 where the portion size allowed is often unfeasible). The cost of the diet is shown in figure 13, although demonstrating borderline affordability in the cold season, the hot season is again highlighting a large gap between income and the cost of the most nutritious diet available.

The table (table 9) below also show the quantities which the foods would have to be consumed in. They are now bordering again on being unfeasible large quantities. Almost 5Kg of milk in one day for the poorest household, this may be consumable but *it is questionable whether these household would have a sufficient number of animals to provide them with this quantity of milk.*

Table 9 Maximum frequency of 3 times per day for the very poor (6 people per household)

	Cold	Hot	Rainy
	Grams / day	Grams / day	Grams / day
Millet	799	751	751
Peanut	883	315	877
Butter	89	89	89
Camel Milk	2286	0	2287
Powdered Milk	0	1079	0
Buttermilk	2313	0	2615
Dates	0	0	384
Mutton	0	320	0
Jujube	217	0	0

Even though this diet is pushing the boundaries of what is affordable and consumable there are still certain nutrients which would be lacking within this above diet as can be seen in the figures 11 and 12. Some crucial micronutrient requirements are still unable to be met especially during the hot season when milk availability is at its lowest. To increase the frequency which any food found locally can be consumed any further in any of the seasons would drive the cost up even higher, widening the gap between income and affordability.

For that reason other avenues of intervention need to be explored; increasing the consumption of certain food items available locally is not a sufficient intervention alone and other food based approaches may be necessary for example increasing the diversity and range of foods available on the local market which have been transported in from elsewhere.

Figure 11

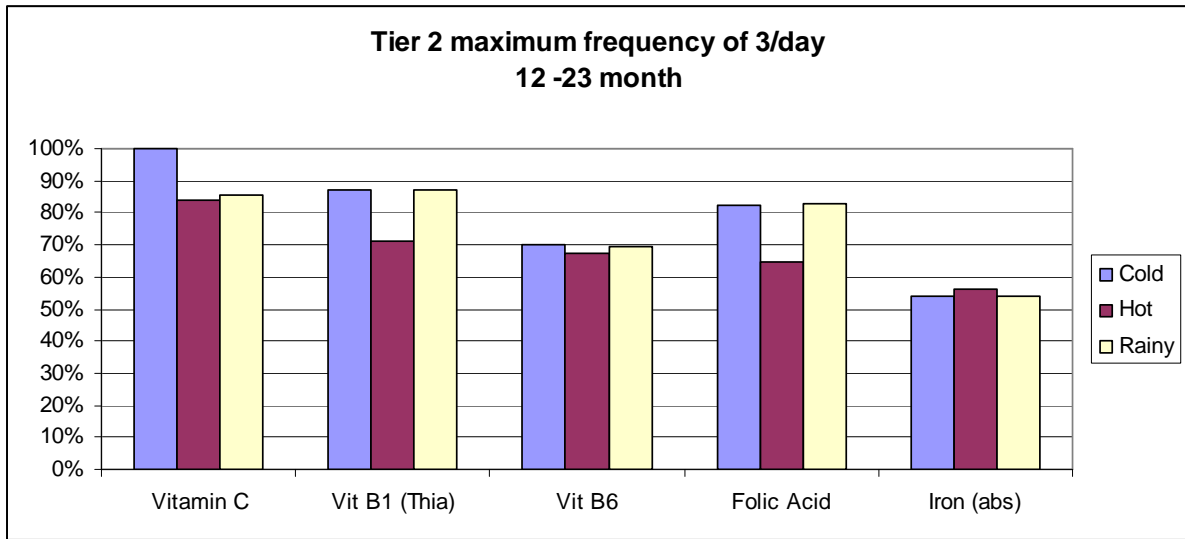


Figure 12

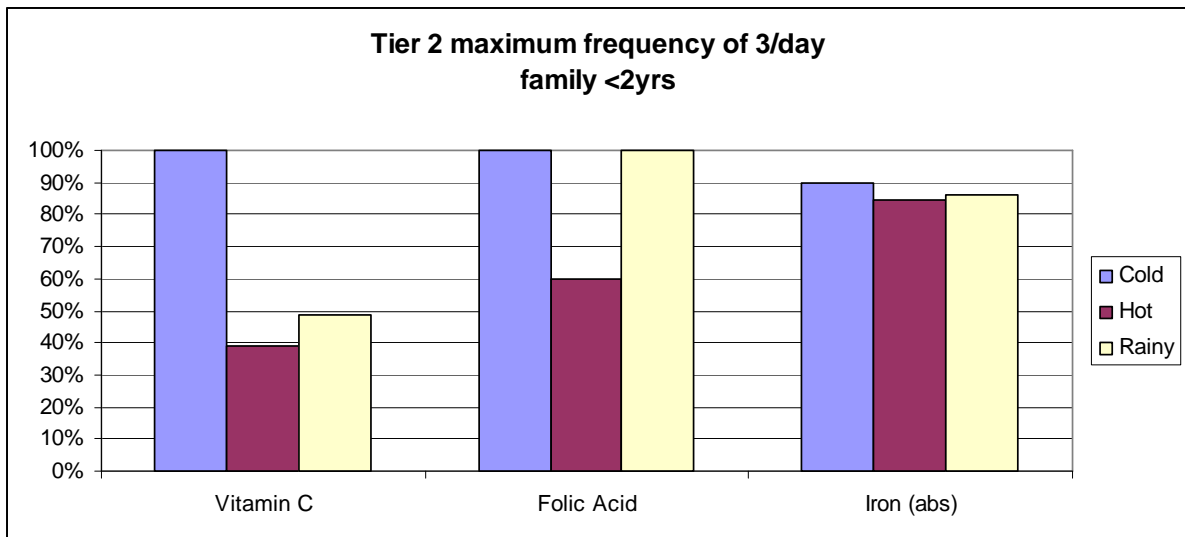
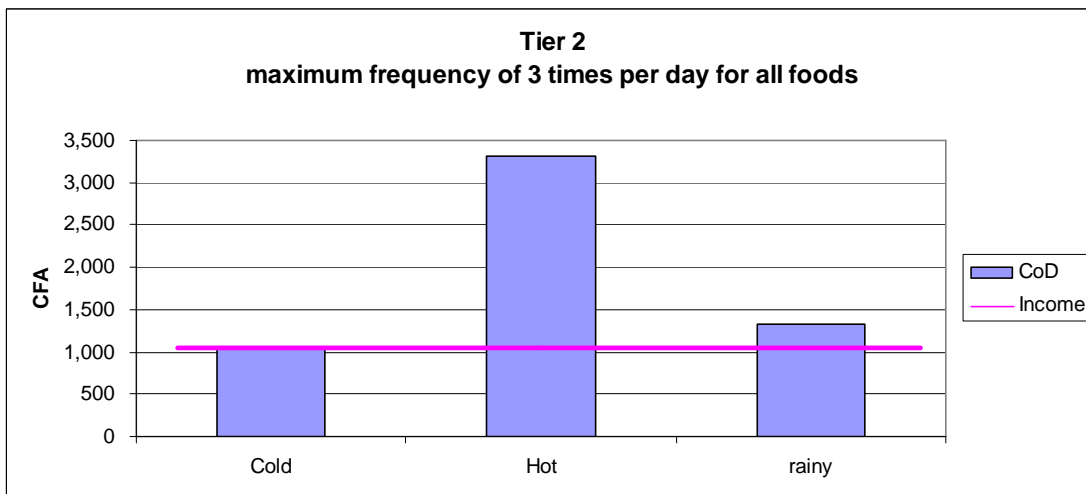


Figure 13



3.2.3 Scenario Modelling

A range of different scenarios were run in order to inform potential recommendation options.

The results when the programme is run using the consumption pattern data (tier2) show that there is the potential for micronutrient deficiencies within the diet for some household within the region.

The following scenarios show some potential food based interventions which could improve the diet quality for those household. The results show potential impact and are not absolute recommendations. Neither are these the only possible solutions. Any intervention should be structured within a long term sustainable programme which has been well researched within a partnership with the local community.

Scenario 1 – Improving the diet quality in the hot (lean) season

Owing to the lack of milk availability during the lean period the results show that the lowest cost diets are unable to meet even the most basic requirements (see figure 10). In order to explore what options there are for households to improve the quality of the diet using foods which are available locally, the analysis was conducted again this time allowing foods which are generally not consumed but are available to purchase. The changes made were as follows:

- i) the portion size of cereals allowed was increased by 25% (to compensate for the lack of energy found in milk)
- ii) Powdered Milk, dates, sardines and mutton were permitted to be included in the analysis as they are available in the markets even though they are not consumed by the poorest households.

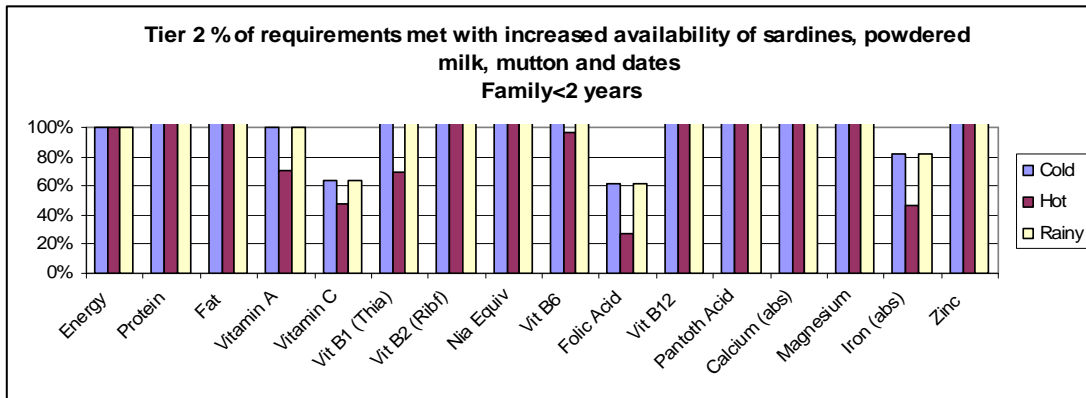
The results still show the best possible diet at the lowest cost if households were to include more nutrient dense foods into their diet. The foods selected are shown in table 10 and the % of requirements met shown in Figure 14.

Table 10 Foods selected when frequency constraints allowed powdered milk sardines, mutton and dates into the diet.

	Cold	Hot	Rainy
Breastmilk	532	532	532
Rice	-	838	-
Millet	1077	720	1077
Semolina	-	99	-
Macaroni	-	128	-
Peanut	299	-	299
Sunflower Oil	85	197	85
Camel Milk	920	-	920
Powdered Milk	507	518	507
Buttermilk	1846	-	1846
Fish Sardines	-	6	-
Sugar	-	28	-
Mutton	-	290	-
Dates	837	114	837

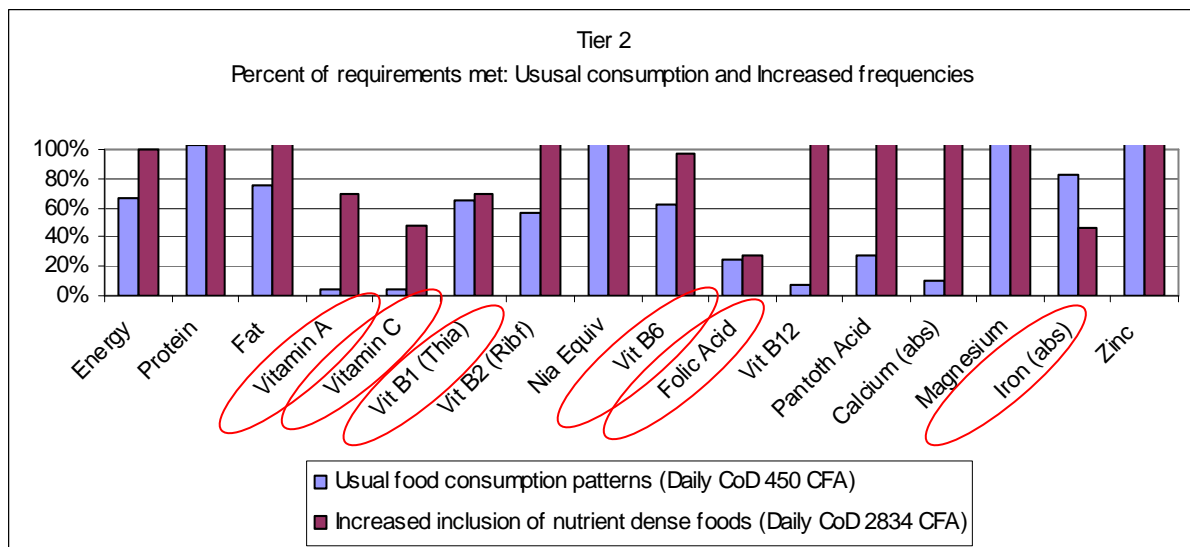
As is highlighted by Table 10 if milk is not available crucial nutrients have to be provided by foods which are not currently eaten such as powdered milk, meat and sardines. These foods are largely not eaten as a result of cultural norms which are potentially further entrenched owing to the high cost of these foods. These additional foods (mutton sardines, powdered milk) are not selected by the programme when milk is available even though they could be, only dates are selected, suggesting that when it is available milk is the best and most economical source of micronutrients, with dates are providing some key micronutrients, most prominently vitamin C.

Figure 14



If figure 14 is looked at along side figure 10 the improvement in the diet can be easily seen. Figure 15 shows the season where the availability of a high quality diet is the most limited, the hot season. The percent of the total requirement which can be met when the diets are restricted by the frequency of consumption that was reported during the data collection alongside the percent of requirements met when powdered milk, dates, sardines and mutton are allowed into the diet. This highlights the impact which a food sensitisation intervention to encourage the consumption of more diverse foods could have on the diet quality. And sensitisation programme would however have to take into consideration the additional cost of including these foods in the diet. These additional costs as highlighted in the figure below will further widen the gap between the cost of a quality diet and a households income therefore additional programming which addresses the economic constraints needs to be considered.

Figure 15



Although there are still a number of micronutrients that cannot be met the quality of the diet is substantially improved, however so has the cost. The diet which is far better in quality would cost 268% more than the average daily income of a poor household.

Scenario 2 – The impact on diet quality when ripe mango and papaya are available

As can be seen from the following 3 figures (figure 16 to 18), the inclusion of mango and papaya into the diet made considerable improvements on the quality of the diet. In the cold and rainy season the inclusion of fresh fruits meant that the diets calculated were able to meet vitamin c, vitamin B12 and calcium as well as making a marked improvement on vitamin B6, folic acid and pantothenic acid.

The hot season however, when achieving a diverse and micronutrient rich diet is even more challenging the availability of mango and papaya makes dramatic impact on the vitamin A, C, B1, B6, folic acid and iron. As can be seen in Table 11 however the amounts of fruits selected were very similar in all seasons.

The nutrients which are provided by the milk in the cold and rainy seasons are not provided by the mango and papaya. Therefore it can be said that increasing the availability of mango and papaya will improve the availability of certain nutrients outlined above across all seasons but can not be expected to have an additional impact on the diet quality during the lean or hot period.

Figure 16

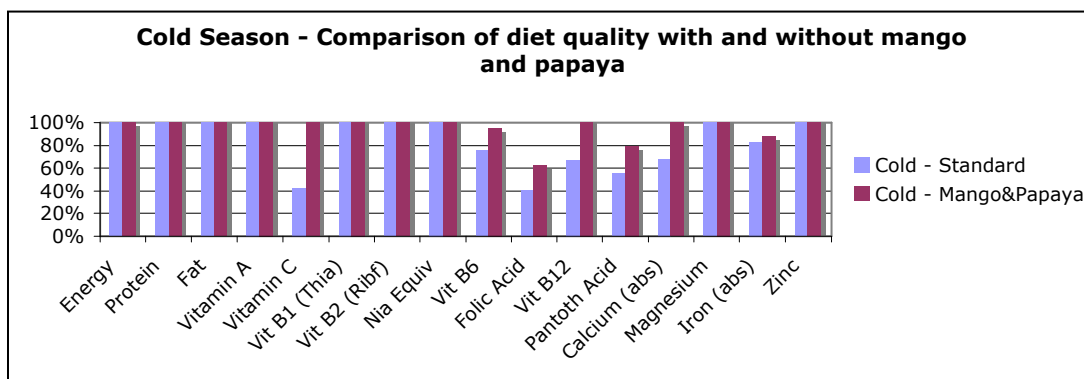


Figure 17

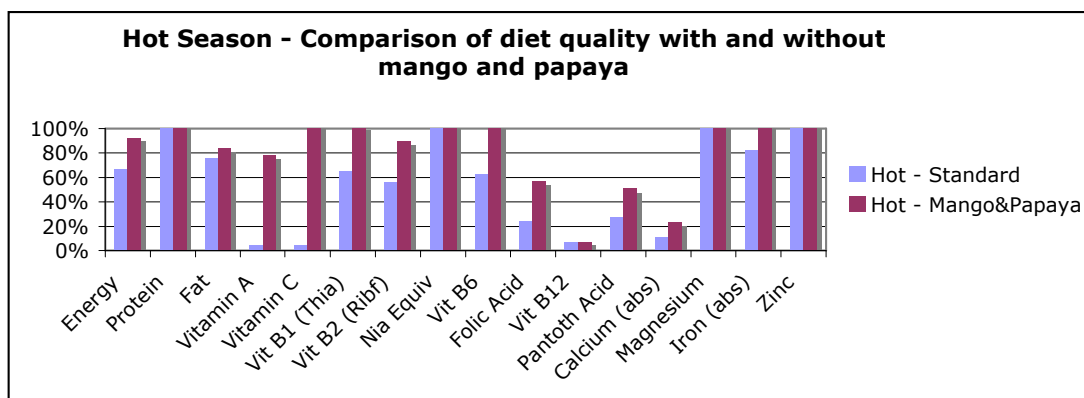


Figure 18

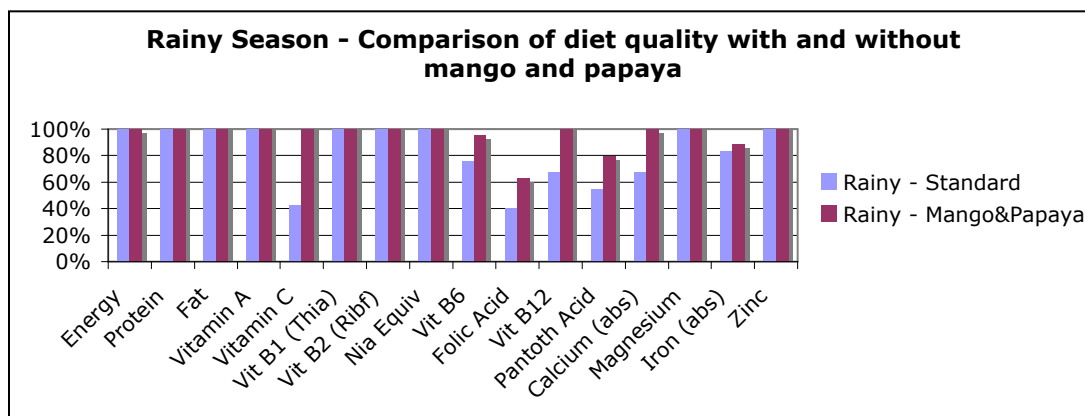
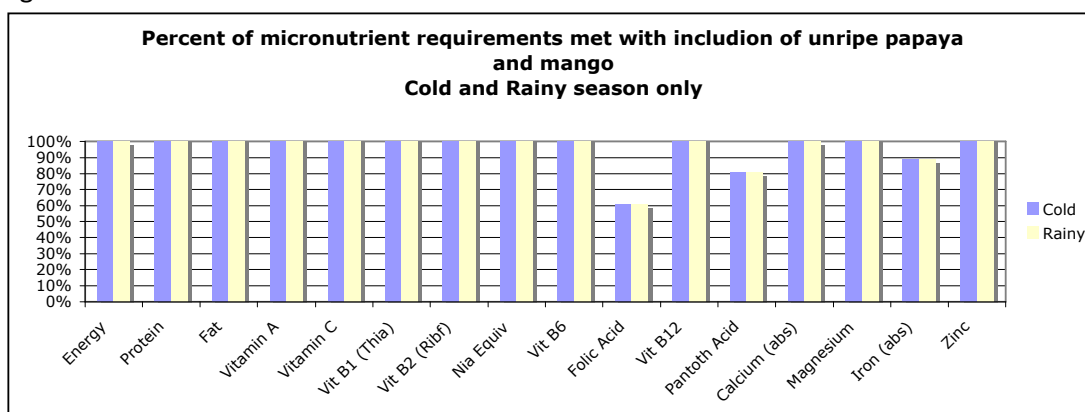


Table 11 Grams per day selected for family >2years by season when papaya and mango was included.

	Cold	Hot	Rainy
Breast milk	532	532	532
Rice	0	38	0
Millet	1429	1771	1429
Macaroni	5	142	5
Sunflower Oil	198	199	198
Milk (goat)	19	0	19
Milk (camel)	2463	0	2463
Buttermilk	2935	0	2935
Sugar	28	28	28
Mutton	43	43	43
Dates	6	0	6
Mango	831	837	831
Papaya	837	837	837

The analysis was also conducted with unripe mango and papaya. The unripe versions of the fruit are consumed and used in cooking in certain areas of Mali. The unripe variety of the fruit is easier to transport without spoiling and therefore could provide a viable intervention. For the cold and hot season the introduction of unripe papaya and mango proved to be a valuable source micronutrients with only folic and pantothenic acid and iron not lacking in the diet (see figure 19)

Figure 19



The cost of each of the scenarios up until this point are outlined in the table below, all are for the very poor household. They must however be looked at in conjunction with the figures detailing the quality of the diet. Although the scenario which included mutton, sardines, dates and powdered milk is more expensive it is also the diet which is of the highest quality. The mango and papaya were included into the diet free of charge however this is not likely to be the case if an intervention to introduce these fruits into the market place in Tarkint were to take place.

	Daily Cost (FCFA)	Daily income (FCFA)
Scenario 1 Mutton, sardines, dates, powdered milk	2,294	1057
Scenario 2 – Ripe mangoes and papaya	671	

Scenario 3 – Improving the quality of the diet during the cold season by introducing eggs, liver and cram cram.

The cold season has been used as an example and the same analysis and conclusions could broadly be applied to the rainy season. The hot season however, when milk is not available is be dealt with separately.

In order to try and explore how to improve the quality of the diets additional foods were included into the available foods list, or the frequency of existing foods was increased thereby allowing them to be included more frequently in the diet.

Based on the micronutrients which were difficult to acquire with the current dietary patterns the following foods were introduced; eggs, liver, cram cram and sardines.

They were “allowed” to be selected up to 7 times per week for all members of the family.

This level of manipulation of the diet improved the quality of the diet substantially although all requirements were still not met.

Table 10 shows the percent of “problem” nutrients which were met.

Table 12 Percent of requirements of “problem nutrients” met during the Cold Season

Nutrient	12 -23 month		Rest of Family	
	% met using tier 2	% met with introduction of eggs, liver, cram cram and sardines	% met using tier 2	% met with introduction of eggs, liver, cram cram and sardines
Vitamin C	85 %	84 %	40 %	49 %
Thiamin	81 %	90 %	-	-
Vitamin B6	65 %	100%	-	-
Folic Acid	55 %	74 %	48 %	85 %
Pantothenic Acid	86 %	100 %	71 %	100 %
Calcium	70 %	100 %	-	-
Iron	64 %	86 %	-	-

The level of “problem micronutrients” within the diet was increased substantially for all nutrients except vitamin C which is still difficult to achieve without the introduction of vegetables or fruit to the diet as was shown in scenario 2.

The additional foods were selected for inclusion because they are or could more easily be made available. Sardines are already available and accepted to some degree by the community¹³. The production of eggs through the keeping of chickens could be a practical livelihood intervention strategy, the consumption of liver already takes place once an animal has been slaughtered but as this is rare it is not readily available and is not available to purchase on the market.

Cram cram is a wild food which is available for collection during the cold season, degradation of the local environment has had a negative impact on the availability of wild foods, every effort should be made to support the preservation of the local environment and so that the sustainable collection of wild foods can take place.

The cost of the diet with the additional food items included increased from CFA 802 to CFA 1734 per day for the whole household bearing in mind that all nutrient requirements were still not met. For those foods which are not currently available for purchase within Tarkint, eggs and liver, the price was taken from Téméra.

Scenario 4 – Inclusion of foods from Tarkint – All Requirements Met

Scenario 4 included food items from nearby Temera and some from Yorosso in order to explore what opportunities are available to introduce foods from other parts of Mali and what the impact of these might be on the quality of the diet.

Table 13 demonstrates the grams of food which would need to be consumed per day by the poorest household in order to meet the requirements. It is clear as before that in the cold and rainy season when large quantities of milk and dairy products can be included in the diet free of charge the cost of the diet is much less than during the hot season when it isn't, during this season the additional inclusion of dried fish, papaya, jujube make a great impact. The diets in all seasons benefitted from the inclusion of liver and pumpkin or baobab leaves as they are key providers of iron which is a difficult micronutrient requirement to meet, especially for 12 -23 month olds.

The costs of these diets are calculated using the actual price of the food items in the area where they are produced. All apart from the Baobab leaves are the prices of these food as they are sold in Temera. The seasonal availability is also taken from when they are available in the markets of Temera or Gao.

The cost of these food items would be more if they were to be available in Tarkint owing to additional transportation costs. Unless the introduction of these foods were to be subsidised.

Table 13 Scenario 4 grams per day for the very poor household – All requirements met.

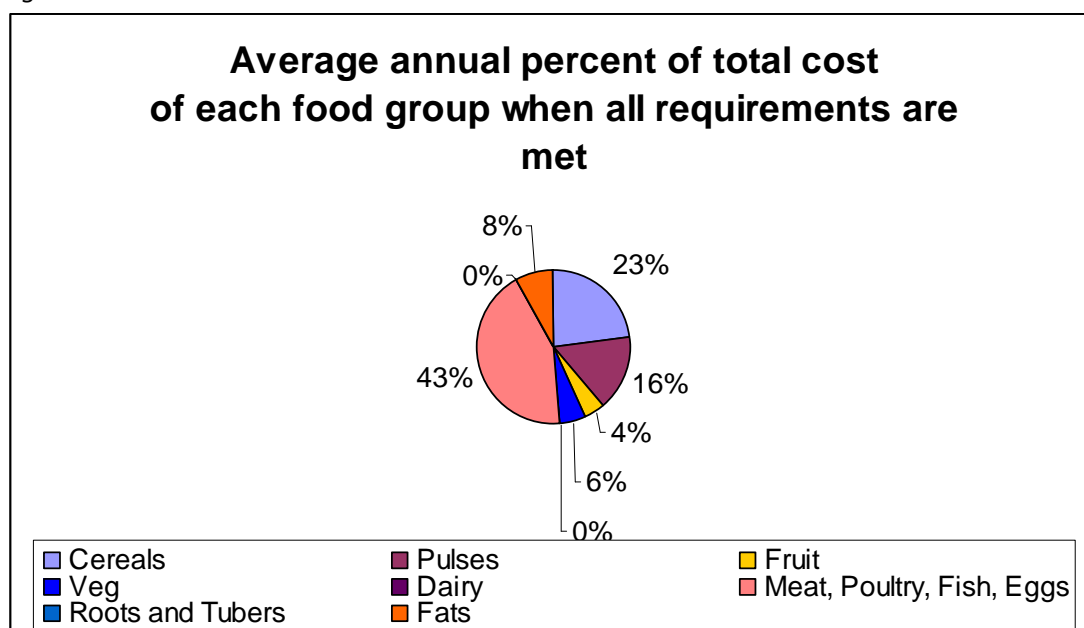
	Cold	Hot	Rainy
	G / day	G / day	G / day
Breast milk ¹⁰⁵⁷	532	532	532
Rice	-	-	-
maize	-	27	-

¹³ Despite fish not normally being an acceptable part of the diet of a pastoralist's household, canned sardines have been relatively well accepted after being introduced as part of food aid packages.

Fonio	349	-	325
Peanut	294	12	297
Sunflower Oil	85	106	85
Camel Milk	1134	-	939
Powdered milk	-	488	-
Buttermilk	4284	-	4479
Jujube (dried)	-	284	-
Papaya	102	299	284
Dried Fish	-	209	-
Pumpkin leaf	299	-	-
Liver	173	299	298
Boaboab leaf	-	309	15
Daily CoD – CFA	1,151	2,512	1,241
Daily income – CFA (average)	1057	1057	1057

The foods highlighted in red are the food which can not currently be found in Tarkint. The were other foods which were included into the analysis but were not selected. The additional micronutrients which are potentially lacking in the diets as shown in figure 9 and 10 are provided by the inclusion of fruits (jujube and papaya), leaves, fish and liver. Figure 20 shows the proportion of cost of the total cost of the diet (annual) which would be spent on each food group. It is clear that the largest hare of the cost comes form the high expense of meat and fish products. Exploring ways in which to overcome the high cost are recommended, for example such as community farming, where animals are reared as a community thereby distributing the risks across the a community cooperative would also mean having a more regular access to meat and meat products.

Figure 20



Scenario 5 – Introduction of micronutrient sprinkle sachets for 12 -23 month olds in cold season

As can be seen from table 10, above the diet quality of the 12-23month old is not as high as for the rest of the family. The requirements of this age group are relatively higher than for other age groups during this vulnerable time of transition to complementary foods. One short term option for improving the nutrient intake of this age group would be to distribute a micronutrient sachet, a home fortification strategy whereby a combination of micronutrients is sprinkled on to the child’s food before consumption.

Table 14 Composition of micronutrient sprinkle home fortification

Vitamin A 300 µg	300 µg
Vitamin C	30 mg
Vitamin D	5.0 µg
Vitamin E	6 mg-a-TE
Vitamin B1	0.5 mg
Vitamin B2	0.5 mg
Vitamin B6	0.5 mg
Vitamin B12	0.9 mg
Folic Acid	160 µg
Niacin	6 mg
Iron	12.5 mg
Zinc	5 mg
Copper	0.3 mg
Iodine	90 µg

Source: Sprinkles Global Health Initiative

When this was forced into the programme as per the recommendations from the Sprinkles Global Health initiative the diet all the requirements were met except for calcium and pantotheinc acid, which are not components of the fortification. For the purposes of this scenario testing the fortification was included as a free item as would happen during a targeted distribution. This meant the cost of the diet for 12-23month old in the cold season was CFA 39 per day. Table 12 puts this in context with the other diets which have been explored.

As the home fortification does not provide the child with the complete intake of macro and micro nutrients which they require, a combination package is needed. Using the CoD methodology to explore the impact on cost and potential intake that a home fortification and increased intake of nutrient dense foods could have. For example when the micronutrient sachet was forced into the diet and sardines made available the diets were able to meet all nutrient requirements (figure 21). The impact was that the cost increased (shown in table 15)

Figure 21

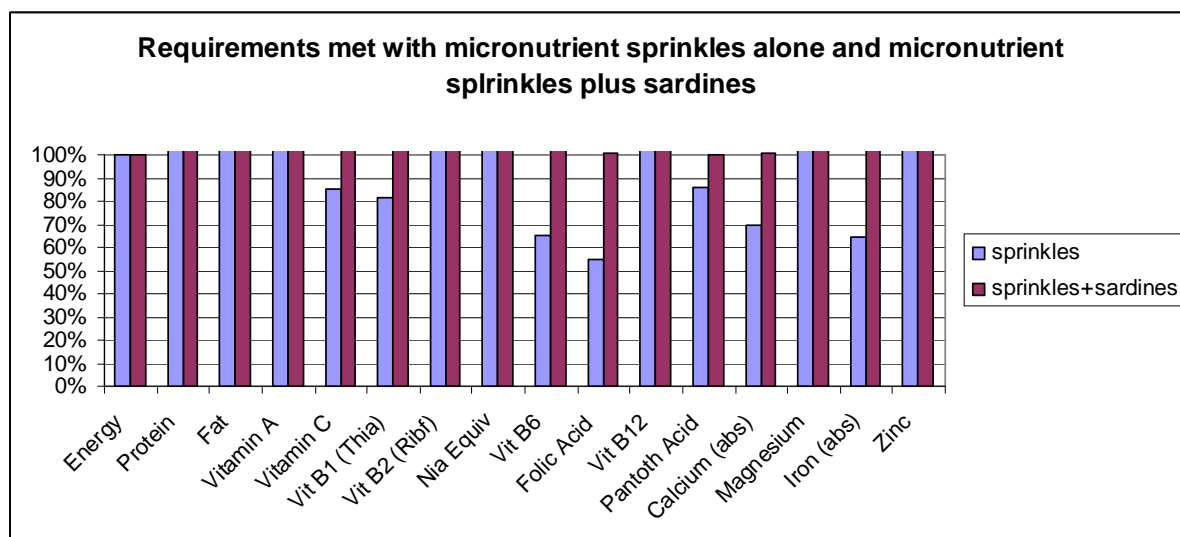


Table 15 CoD and requirements met using different scenarios for 12-23 month old in the cold season.

	Tier 1	Tier 2	Tier 2 + additional foods	Tier 2 + micronutrient fortification ¹⁴	Tier 2 + micronutrient fortification + sardines
Daily cost of diet for 12-32m (CFA)	44	39	119	39	71
Requirements met	Not all requirements met	Least amount of requirements met	Not all requirements met	Most requirements met	All requirements met

Scenario 6 – Food fortification during the hot season

During the hot season the foods available are limited even further, and crucially milk, which is a key provider of energy, fat and many vitamin and minerals is not at all available. Refer to figures 10 for the nutrient quality of tier 2 diets during the hot season when the lowest cost diets reflect the current eating patterns.

During the lean or hungry season the household have limited options for providing sufficient intake of food for all members of the household and therefore we can use the CoD methodology to explore the impact that potential interventions might have.

There are several options available ranging from grain distribution to the distribution of fortified foods and supplements which are demonstrated in the following scenarios.

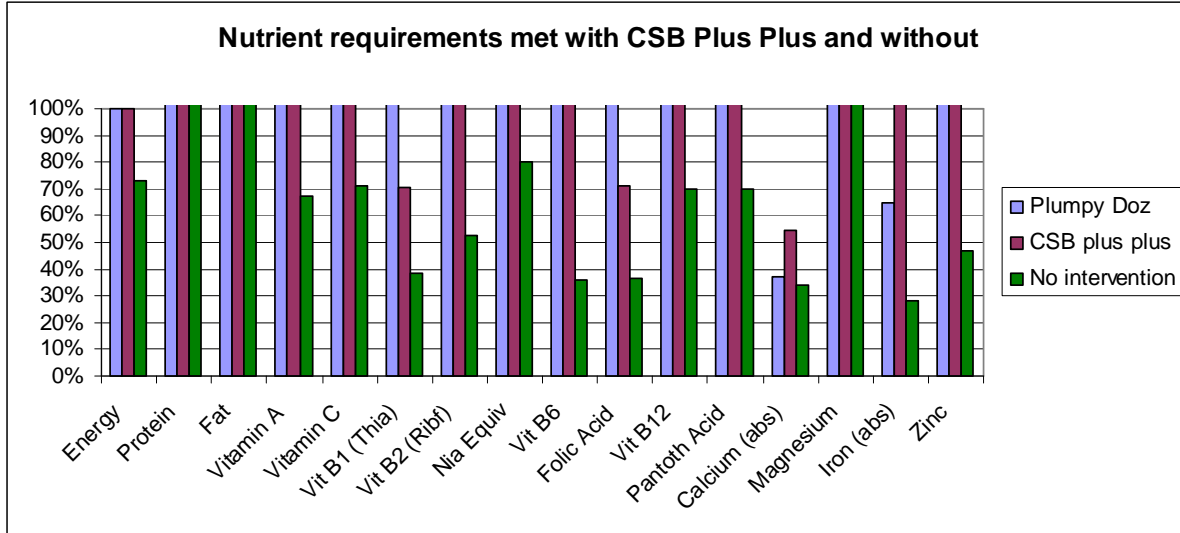
Scenario 6.1 – Provision of CSB Plus Plus for 12 – 23month

¹⁴ All supplementation and fortification was included into the analysis free of charge

CSB Plus Plus is a fortified version of the usual corn soy blend which is designed especially for the 6 – 23.9 months. The composition can be seen in the annexe.

When this is included into the diet as a free food item, i.e. provided as part of a distribution, the nutrient quality of the diet improved dramatically as can be seen in figure 22

Figure 22



Scenario 6.2 plumpy d’oz

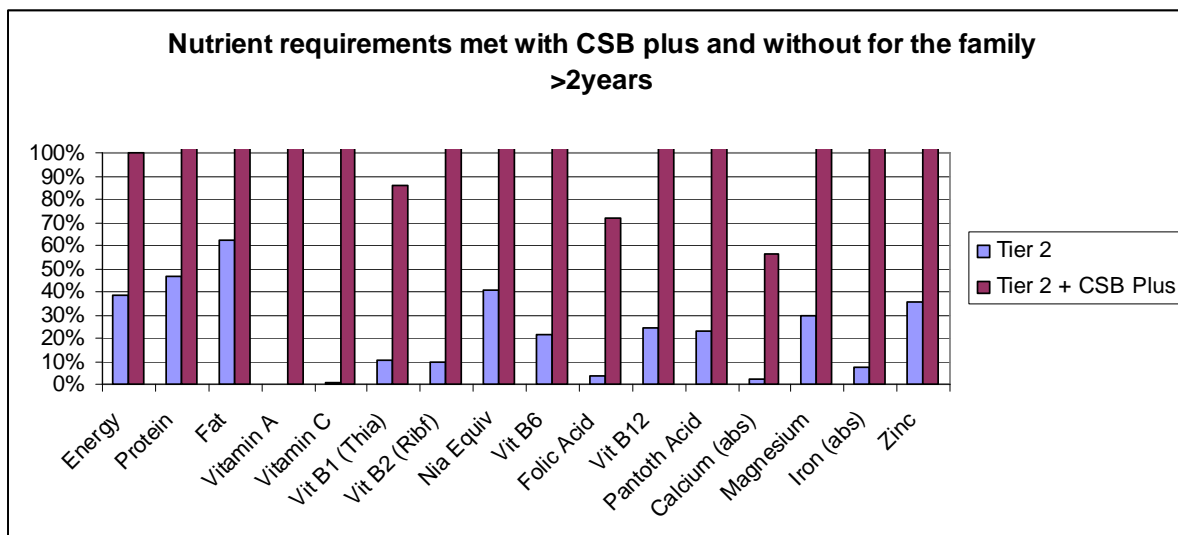
Plumpy Doz is a ready to use food (RUF) which is a peanut based high energy, micronutrient fortified food. It is used as a prevention strategy for children under 5 who are at high risk of severe malnutrition or are already moderately malnourished. Plumpy doz itself is produced by nutriset but there are opportunities to produce products like this on a local and regional level.

When Plumpy Doz was included into the diet of a 12-23month old during the lean period (hot season) at a recommended serving of 3 teaspoons 3 times a day the diet was able to meet all requirements bar calcium. This reduced the cost of the diet considerably to CFFA 23 per day which is 2 % of the daily income of a household of 6.

Scenario 6.3 CSB Plus for rest of family.

Corn Soy Blend Plus is the existing CSB formula with added fortification of micronutrients suitable for all members of the household about 2years of age. The composition can be seen in annexe 3. When this is modelled so that a diet is calculated based on the consumption of CSB twice per day and millet once per day (3 meals per day) as well as increasing the meat consumption to 3 times per week; the quality of the diet improves, notably the energy and protein and all micronutrients.

Figure 23



The impact that distributing CSB plus for 12-23month olds and CSB plus for the rest of the family is that the daily cost of the diet would be FCFA 1029, this is still above the daily income figure of FCFA 783 and not all requirements are met (thiamine, folic acid, calcium). However the inclusion of the fortified foods has bought the cost down from the original tier 1 diets (FCFA 1794 per day) whilst increasing the nutrient quality.

3.3 Tarkint Discussion

The results of the CoD analysis in Tarkint demonstrate the household's, especially those in the lowest wealth brackets are extremely vulnerable to food insecurity and poor diet quality. Seasonality plays an important role with the hot season being the most insecure time where food availability is low and specifically there is a lack of milk available. These results are reinforced by the nutrition data which also indicates a period of acute food insecurity during this time. The recent irregular rain fall, decreasing pastoral availability and increasing food costs further compounds the situation increasing the vulnerability of the population. This indicates that there is a need for an intervention which is time bound in order to prevent household's from experiencing severe hunger during march to may. It is clear from this analysis that it is not only an issue of income and affordability in the region which is preventing households from accessing sufficiently nutritious food sources. The lack of diversity of foods available throughout the year, though especially in the hot season is of concern. The anecdotal reports that the availability of wild foods is decreasing means that additional sources of nutrients from foods which were not purchased should no longer be relied upon. This is also compounded by the semi settling of traditionally pastoralist household which means they may not have access to wild foods in the same way they once did.

When looking at the lowest cost of a diet generated by using the tier 1 analysis it appear that all wealth groups except the very poor should have sufficient income to afford a diet which meets the majority of their requirements however this is based on the intake of free milk being over 1.4 kg per person per day for the poorest household and over 2kg per person per day for the richest household (in the cold season). Whilst households in the zone to delay heavily on the production and consumption of milk this is large quantity of milk to both produce and consume. What this does highlight is the vulnerability of these household, especially the poorest if they experience loss of livestock or they are forced to sell assets in order to raise funds for other expenses. This would

mean an inevitable reduction in the amount of milk which they can consume and therefore decrease the quality of their diet further.

In the cold and the rainy season the results indicate that the diet is likely to be of poor quality despite access to milk products. The tier 1 analysis demonstrates that even with the inclusion of large quantities of milk in the diet it is likely to be unable to provide large enough quantities of iron, b-vitamins, vitamin c and folate. A lack of iron in the diet will increase the risk of iron deficiency anaemia affecting women and children the most, increasing fatigue and susceptibility to illness as well as affecting a child's ability to learn and develop at a normal pace. As the iron intake from breast milk is no longer sufficient it is especially crucial that children of 12-23months receive sufficient iron in their complementary foods. The lack of folate in the diet available to households within Tarkint is especially relevant to women of child bearing age in order to allow the pregnancy to develop normally and without complications. Iron and folate supplementation programmes for both women and children is one option for preventing such deficiencies. However iron supplementation to children who are at risk of malnutrition and are in a malaria area is under serious doubt as the additional iron received can in fact worsen the child's susceptibility to malaria.

A micronutrient fortification combined with behavioural change to increase the consumption of a nutritious food such as sardines is shown in the results to improve the quality of the diet for the 12 – 23month olds in the cold and rainy season. However this kind of provision of supplementation is seen as a short term recommendation, if it is distributed free of charge to household in order to improve the quality of the diet it is not a sustainable strategy.

Any intervention aimed specifically at this age group must be combined with continued breastfeeding support and promotion as there is still an essential contribution of the nutrient intake of a child from breast milk.

During the lean period from march to may the results show that not only is it more difficult to achieve adequate nutrient intake but the cost of the foods is also more expensive owing to the lack of available free milk. The seasonal cost of the diet is looked at alongside the annual income figure as the seasonal income patterns are not available. The variability of income will of course have an impact on the household's ability to afford diet so it is not just the fluctuation in cost of a diet which needs to be taken into account but the fluctuations in income and in household ability to generate income.

During the scenario modelling different potential interventions were tested. Inclusion of more nutrient dense foods into the diet such as mutton, liver and sardines all improved the quality of the diet. These foods were selected specifically because they are foods which are currently available in the zone even though they are not consumed by the poorest household. The inclusion of these foods improved the quality of the diets but still did not allow the diets to meet all the requirements, the diet quality was still especially poor during the hot (lean) season.

The scenarios which were explored during the hot (lean) season were predominantly looking at the best way to increase the diet quality through the inclusion of a fortified foods, as the results from this analysis and nutrition surveys demonstrate that achieving sufficient energy alone may be difficult during these time. It is clear that with the provision of the appropriate fortified food there can be a real improvement in the diet quality. If an improvement of this level was to be sought using non fortified foods it would require great adjustment in the types of foods which are available to be bought in the shops (boutiques) which are frequented by the majority of household in Tarkint. This level of change would require not only significant change in the eating habits of the population but would of course likely come at a great cost.

The introduction of fortified foods however also comes with complications specifically around acceptability and therefore just the provision of it alone does not ensure the improved dietary

status of the population. Dialogue with the communities regarding the different options is for this reason essential in order to ensure the uptake of the most effective and appropriate intervention. The distribution of products however is a short term solution aimed at brief periods of food insecurity as they are not sustainable and are vulnerable to external factors which may interfere with them reaching household such as funding, transportation, and import and export factors. There has been experience in neighbouring Niger where a peanut based supplement food has been manufactured locally using local products and local labour. If this is to become a viable and more sustainable option than this should be seriously explored.

Limitations

The findings of the tier 2 analysis is not an assessment of the nutrient content of the individual's diet but an estimation of the population level of nutrient quality. The objective function of the programme is to minimise cost whilst striving to maximise the nutrient content of the diet using locally available foods. This means that the results should be read as estimation of patterns of nutrient deficiency of the diet, that in the hot season for example, a household will struggle to meet their energy and micronutrient requirements. The CoD methodology collects diet consumption data in order to give a snap shot of the situation enabling results which indicate cost and affordability as well as availability of nutritious foods. Further triangulation of these results needs to take place in order to explore the quality of the diets which are actually being consumed and the impact that this is having on nutritional status of households in Tarkint. Localised nutrition surveys conducted during different seasons as well as a more through diet recall survey would help to corroborate these findings.

3.4 Recommendations

The seasonal effect on food security and malnutrition in Tarkint is compounded by the insufficient income experienced by the households. When milk is available the diet is far closer to meeting requirements than during the lean periods. However throughout the year there are issues of inadequate availability of diverse foods in the markets and boutiques were households purchase their food. Any intervention needs to strive to increase the quality of the diet though increasing the diversity of the food products available. Increasing diversity food products alone will come at a cost however and the cost of diet results do show that household are struggling to meet the cost of an insufficient diet therefore the economic barriers need to also be addressed. Without improving the availability of a more diverse diet an economic intervention alone is not going to improve the quality of the diet although could improve the energy density of the diet by allowing households to afford more staples foods during the lean period.

The analysis shows that the inclusion of tinned sardines into the diet would have a positive effect on the nutrient density of the diets and make valuable contributions to the requirements of b vitamins, calcium and zinc especially for the 12-23month olds during the lean season. Anecdotal evidence shows that behavioural change is possible within Tarkint, fish is generally unacceptable as a part of the diet for communities however tinned sardines can be found in some shops and are said to be increasingly accepted. This demonstrates that there is potential that increasing the availability of previously unaccepted foods could in time improve the quality of the diet.

In order to address the increasingly serious food insecurity issues and acute malnutrition especially during the lean period, fortified foods or supplementation offers a short term intervention approach. Continuing monitoring of the situation is required in order to predict

the periods of food insecurity better, because of the changeable weather patterns the lean period is starting at a different time each year. The CoD methodology can be used to assist in this by the regular collection of food price information and regular analysis. It is also vital to keep communication open with the community themselves in order to understand better the best way in which to support and prevent the most vulnerable during times of extreme food insecurity.

Livelihood prevention must form part of any comprehensive package in order to protect household's income, this could take the form of fodder distribution, asset transfer or skills training. As escalating food prices and increasing desertification and decreasing pasture look set to continue a long term and more sustainable approach must be explored. Herd protection and the prevention of livestock loss must feature as part of any package of intervention not only to ensure income opportunities but also to ensure that milk and access to milk by all households remains high. This analysis demonstrates the important role which milk plays in providing energy, fat and key micronutrients which all age groups require in order to develop fully and remain healthy.

4. Téméra

Téméra livelihood zone

The commune of Téméra is an agro-pastoral zone, with low population density, which lies on the River Niger. The valley of the river, sand dunes, plains and ponds make up the topography of the area. The villages are located on both banks of the Niger (the Haoussa in the north and the Gourma in the south) and also in the river islands. The villages are usually divided between several different sites and neighbourhoods are often distant from each other. The majority of the population of this area, the Songhai, are agropastoralists and sedentary. There are also groups of nomadic Bozo fishermen and groups of pastoralists but the HEA and CoD studies focused on agropastoralists.

In the studies, households were divided into four wealth groups: very poor, poor, middle and wealthy. Livelihoods means in this area are especially diverse among very poor households and poor households who depend on rice cultivation, livestock, vegetables, fisheries and migration to different degrees. This risk allocation between different activities is meant to protect against environmental hazards. Though the agropastoralist are generally poorer, they are less vulnerable to hazards than in Tarkint, where livelihoods crucially depend on livestock. Téméra area is chronically deficient in food and is characterized by structural poverty.

The system of traditional rice "flood free" is predominant. The annual rainfall of only 150-200 mm is insufficient for rainfed farming and it is the sole presence of the river which allows culture of rice, bourgou and gardening. Flooding and winds are serious risks for the production; breakage of dikes are common with consequent flooding of crops and crop loss. Small dams are the property of the community and their maintenance is expected to be realized in the form of community work. Indeed, they were traditionally maintained by the state until it decides to invest more in modern infrastructure such as irrigation districts villagers (PIV) for total control of the water. There are also private dikes in the fields to be maintained by their respective owners and to do so, the wealthy households often employ the poorest households. Besides rice, households cultivate bourgou, which is a key livestock feed - particularly in cases of insufficient pasture.

Most soils in the area are sandy and allow the practice of gardening, using the river water to irrigate the land. The main crops are tomatoes, tobacco, pumpkins and watermelons, maintained primarily by women. Opportunities such as picking wild fonio and cram cram are also present in the area and are an important food source, although only covering a short period of time.

Livestock and seasonal migration (exode) are essential activities. The main kinds of livestock in the zone are cattle, sheep and goats, among which cattle are the most popular but are only owned by wealthy households ; poor households and very poor do not benefit from the security provided by the possession of these "banks on legs." The number and type of livestock owned provides the main distinction between rich and poor. Sale of animals and sheep fattening (embouche) are important sources of income. However, embouche is mainly done by the wealthy and average households. The droughts of 1973-4 and 1984-5 are deeply engraved in the minds of people as the worst years of their memory. They triggered the practice of large-scale exode. Today, exode is a source of income and essential food for all wealth groups in the area. Moreover, households typically have family members abroad who have left the area since the years of severe drought and have not returned since. These family members can transfer money to the village.

It is always difficult to identify long term trends. In the interviews, however, villagers reported the increasing desertification in recent decades, the invasion of sand dunes, the impoverishment of fauna and flora and the silting of the river Niger.

4.1 Téméra Market and Site Selection

The majority of the poor and very poor households purchase their food from the small boutiques within the commune or travel to Téméra to visit the market. Access during the rainy season to the markets is severely restricted especially for those villages which become islands in the river when the water rises. Food availability in the markets also decreases in the rainy season because of the bad roads and poor access. A boat stops on a weekly basis during the cold season and first half of the rainy season and food can be purchased from the boat however this is normally done by the vendors rather than households themselves. In order to include a representative sample from across the zone the CSAS (centric systematic area sampling¹⁵) method was used.

Table 17 Markets identified to visit for data collection in Téméra

Place of purchase	Frequency	Frequency people visit it
Téméra (market et shops)	weekly	Weekly
Bariana/ Taamé (informal market)	weekly	Weekly
Tinsakou (informal market)	weekly	Weekly
Fia	permenant	As required
Garye Gungo	permenant	As required
Bossalia	en permanence	As required
Bâteau	seasonal (Sept to Dec)	seasonally
Gao – Rapid Assessment		

4.1.2 Household – Téméra

Table 14 provides an overview of the number of people in the average household by wealth group as well as some details on livestock and land assets. This information was used to assist in the identification of the poor and very poor households for inclusion in the frequency interviews. The household composition is intended to give an approximate estimation of the number and ages of children, adults in households in the zone in order to establish the total energy, macro and micro nutrient requirements during the analysis. The household composition was estimated by the field staff.

Table 18 Household composition and wealth definitions for Téméra

	Number of people in household	Estimated household composition	Amount of land cultivated	Livestock
Very Poor	6 – 8	1 – Father 30 - 59 2 – Mother 30-59 3 Child 10 4 Child 8 5 Child 6 6 – Child 3 7 - Child 12-23m	0.5 - 1 ha	0 - 2 goats, 4 - 6 poultry
Poor	8 – 10	1 – Father 30 - 59 2 – Mother 30-59	1 - 2 ha	3 - 5 goats, 0 - 2 cows, 0- 2

¹⁵ Centric Systematic Area Sampling (CSAS) – Using a map showing all villages and towns in the zone. A grid of equally-sized squares is then placed over the map. The number of squares in the grid should equate to the number of sites from which data will be collected. The location of each data collection site is then the village or town nearest the centre of each square.

		3 - Child 18 4 - Child 13 5 - Child 11 6 - Woman 18 – 29 7- Man 18 – 29 8 – Child 3-4 9 – Child 12-23m		donkeys, 4 - 6 poultry
Middle	10 – 12	1 – Father 30 - 59 2 – Mother 30-59 3 Child 18 4 Child 15 5 Child 11 6 -Child 12-23m 7 - Woman 18 - 29 8 – Man 18 - 29 9- Child 8 10 – Child 5 11 – Child 12-23m	5 - 6 ha	8 -10 cows, 2 pulling cows, 12- 14 goats, 7-9 sheep1 - 3 donkeys, 5-7 poultry
Better Off	14 - 16	1 – Father 30 - 59 2 – Mother 30-59 3 Child 18 4 Child 15 5 Child 11 6 - Child 8 7 – Child 12-23m 8 - Woman 18 - 29 9 - Man – 18-29 10 – Child 7 11 Child 12-23m 12 - Woman 18 - 29 13- Man – 18-29 14 Child 3 15 - Child 5	8.5 - 9.5 ha	21-23 cows, 4 pulling cows, 22- 24 goats, 14-16 sheep, 4-6 donkeys

4.1.3 Seasonality – Téméra

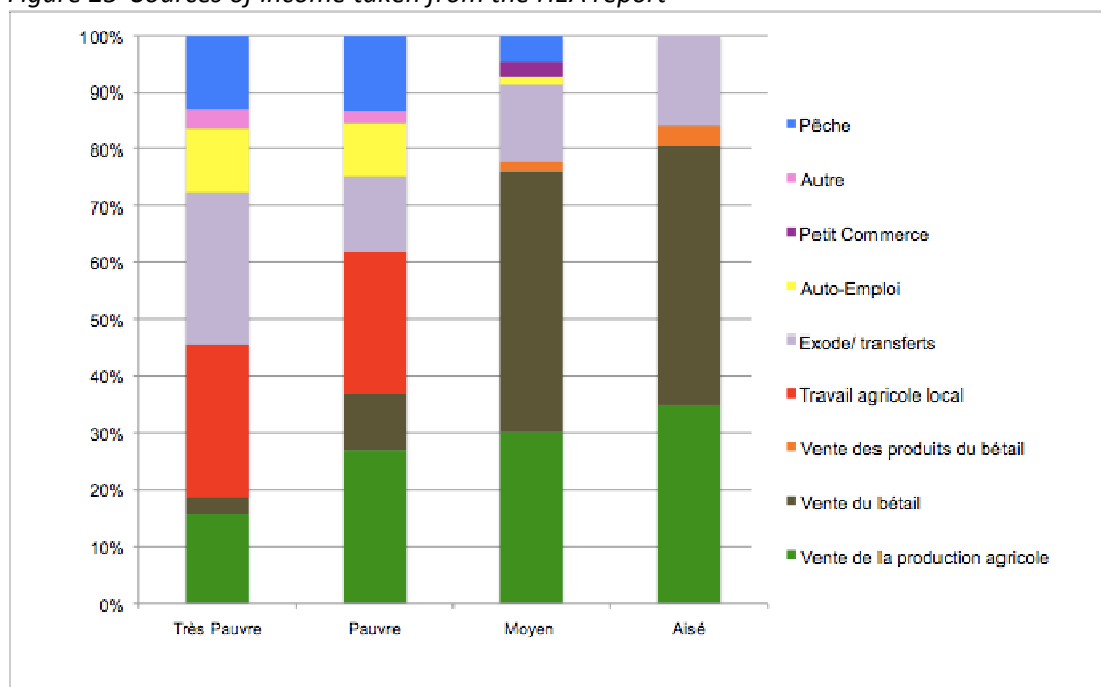
The seasonal calendar in figure 24 shows the main events which define a household's food security and ability to access income and food. The main lean season is July to October, before the rice harvests and when the rains are most heavy. This is also the season where malaria is at its peak. If members of the household are ill with malaria this has an impact on the productive work force of the family, additional expenditure such as health bills as well as the physiological impact that having malaria has on a persons ability to maintain a satisfactory intake of food.

The lean period however is also the peak time for milk production and wild food collection which can provide valuable sources of energy and micronutrients.

Figure 24 Seasonal Calendars for Téméra

	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct
	Cold				Hot			Rains				
Rice harvest												
Milk production – cow												
Milk production												

Figure 25 Sources of income taken from the HEA report



4.2 Téméra Results

4.2.1 Tier 1

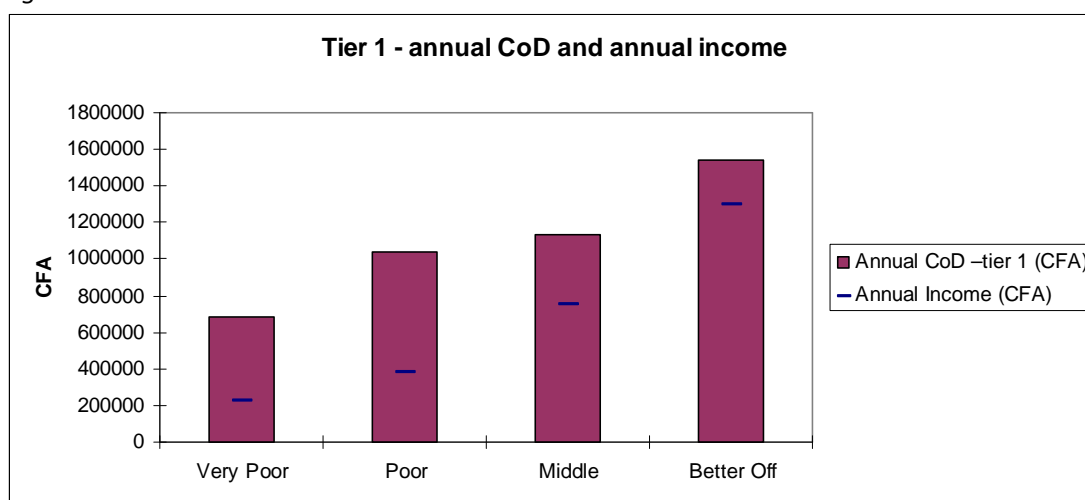
For many of the results shown here one household size/wealth group has been singled out to illustrative purposes. The cost of the diet has been illustrated by wealth group but after that only one wealth group is shown. The diets selected for each wealth group followed the same patterns, concerning types of foods selected it is only the quantities and therefore the cost which varies. The seasonal variation is also shown to highlight the impact on seasonal availability of foods the change in cost and the fluctuations in overall affordability of a diet.

The results from tier 1 show that the lowest cost diet which meets all the requirements is unaffordable for all wealth groups. The cost of the diet changes for each wealth group as the number of people within each household changes. All wealth groups experience the same fluctuation in seasonal cost of diet. The seasonal difference in CoD is relatively small compared with Tarkint for example. On average across all wealth groups the CoD of the diet increased by 16% between the cheapest season, cold season and the rainy season. However this may not necessarily mean that the affordability between the cold and the rainy season is not substantial. The income capacity of a household is reduced during the rainy season before the harvest of rice and other crops which means the daily income available to be spent on food may be less than the average for the year which is shown here.

Table 20 demonstrates the cost of a diet for a household in each wealth group and the annual income

	Annual CoD – tier 1 (CFA)	Annual Income (CFA)	% increase in income required
Very Poor	687650	227866	202%
Poor	1038078	382269	172%
Middle	1135096	750392	51%
Better Off	1538239	1294446	19%

Figure 26



When the HEA was carried out in 07/08 the better off households spent 67% of household income on non- food items this level of household expenditure on non food items may be reduced in years where the harvest was not as successful as was the case in 2008/09, so as to be able to afford food needs.

Although the wealthier household may be able to meet their energy needs through consumption of their own production what this result indicates is that in order for a household to achieve a diet which is sufficiently diverse in micronutrients, for the household size the income they are currently generating is not enough.

Figure 27

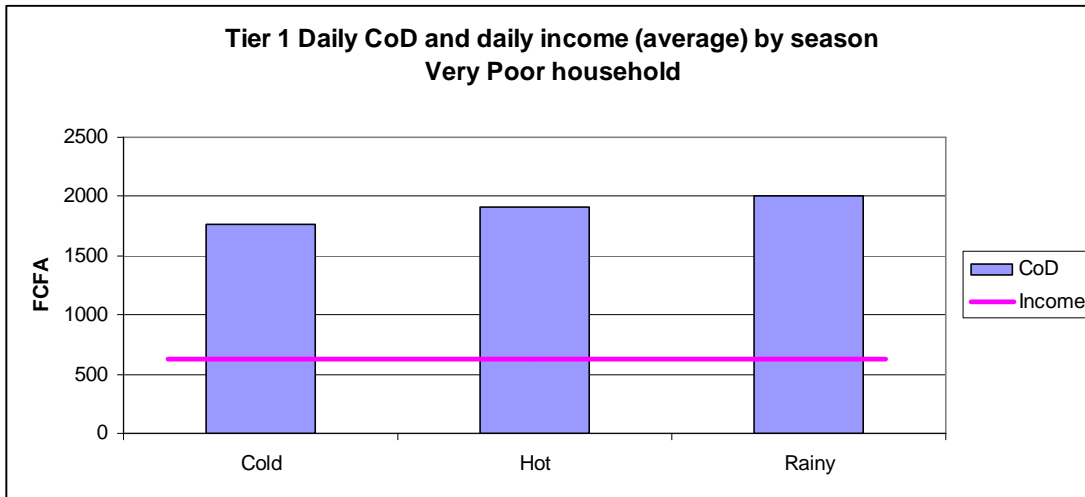
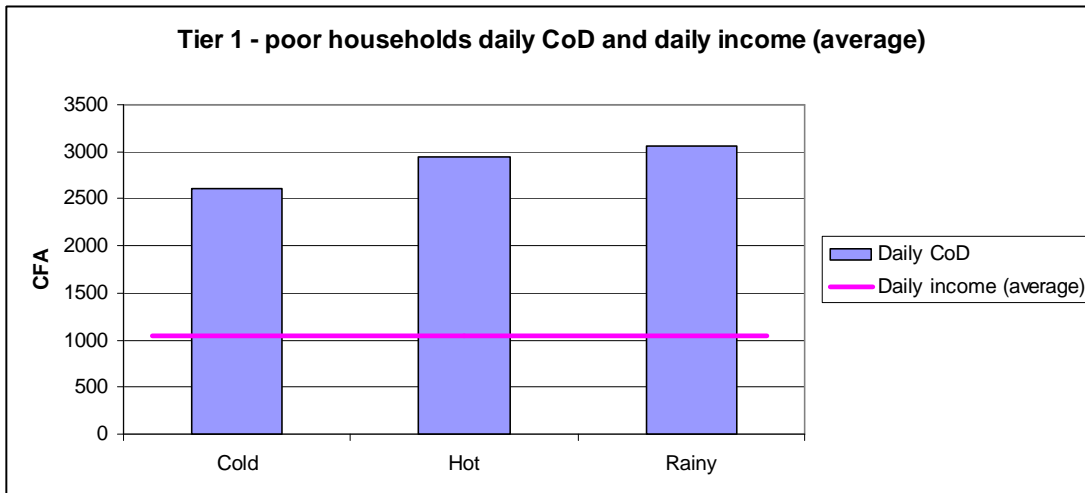


Figure 28



Regardless of wealth group and therefore household size the cost of a diet for a 12-23month old is 5% of under of the total cost for the household. A breakdown of the cost of diet by household member can be found in annexe 5.

Table 21 Very Poor - foods included in the lowest cost diet which meets all nutrient requirements (tier 1)

Cold	g / day	Hot	g / day	Rainy	g / day
Millet	90	Millet	75	Millet	70
Maize	269	Maize	2046	Maize	1306
Butter (cow)	350	Cowpea	139	Cowpea	205
Powdered Milk	394	Shea Butter	100	Powdered Milk	1423
Chicken Egg	39	Powdered Milk	399	Chicken Egg	368
Dried Fish	79	Chicken Egg	1597	Dried Fish	13
Orange	420	Jujube	326	Jujube	209
Watermelon	84				
Fonio	1874				

Table 21 shows the grams per day of food which is required to meet the nutrient requirements of the household. These results indicate that these are the cheapest most nutrient dense foods which are available but this is not to say that this is recommended as a diet.

A large amount of fonio included because it is a wild food and can be collected and consumed free of charge. There is no market price for fonio within the markets visited in Téméra. For a family of 7 this diet is not wholly unrealistic. However in the cold season the diets are heavily reliant on fonio as a free food, during the hot season households would have to consume an inconsumable amount of chicken egg (approximately 30 eggs) and in the rainy season a large quantity of powdered milk.

4.2.2 Tier 2

During the tier 2 analysis the frequency with which different foods could be consumed and the portion sizes were restricted to appropriately reflect the way in which they are currently being eaten. The programme is still run with the objective to find the lowest cost diet which can meet all the macro and micro nutrient requirements whilst still reflecting the patterns in which foods are currently being consumed.

The generic portion sizes, the frequency with which each food item can be selected and range of food group frequency (that is the number of times any food item from a food group can be selected) is shown in annexe 6.

Unlike tier 1 results when the diets reflect more realistically what is usually consumed the lowest cost diet is unable to meet all the nutrient requirements, see figures 29 and 30.

The diets are also more expensive than the tier 1 diets because the programme is unable to include such large portion sizes of the cheaper nutrient sources such as the cereals and eggs, which are not regularly consumed by household. Instead the programme was forced to select a wider range of foods in smaller quantities in order to try and meet the requirements as can be seen in Table 22.

The results highlight that the nutrients which are potential difficult to meet from a diet in Téméra for 12 – 23month olds are; Vitamin A, Vitamin c, Folic acid and iron (figure 30). For the remainder of the household potential problem nutrients are also Vitamin A, Vitamin c, Folic acid but also fat (figure 31). These diets are based on a fairly large amount of milk still being included into the diet.

There is minimal variation in the quality of the diets between seasons . The diets available in the rainy season are just marginally of poorer quality than in the other 2 seasons.

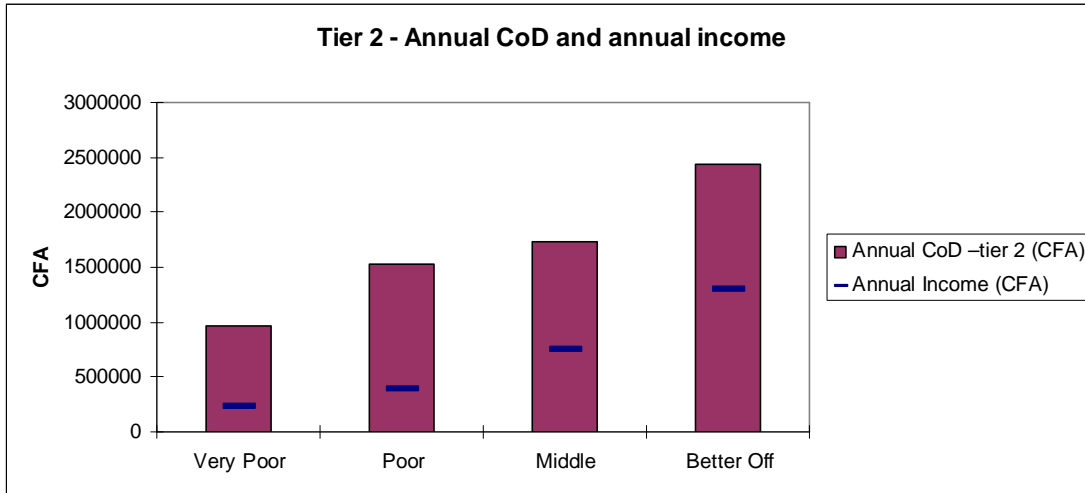
The same pattern of potential problem nutrients can be seen across all wealth groups. For a complete breakdown of cost by family member see annexe 6

Table 22 Tier 2 Annual CoD and Annual income by wealth group

	Annual CoD –tier 2 (CFA)	Annual Income (CFA)

Very Poor	972616	227866
Poor	1528441	382269
Middle	1727454	750392
Better Off	2441056	1294446

Figure 29



Highlights that being able to afford a low cost nutrient dense diet is not a problem just for the poorest household of the zone.

Figure 30

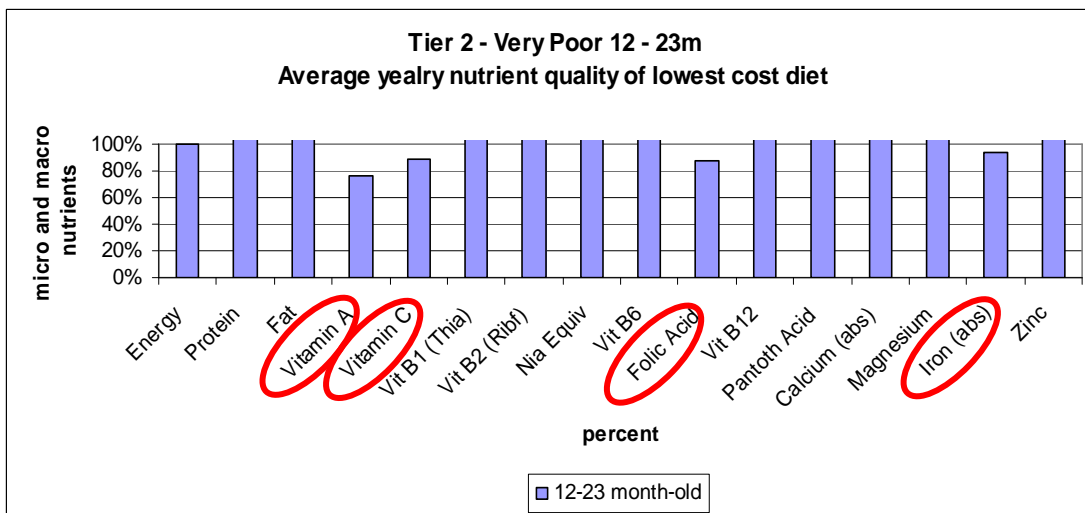


Figure 31 Tier 2 requirements met for the Family >2years

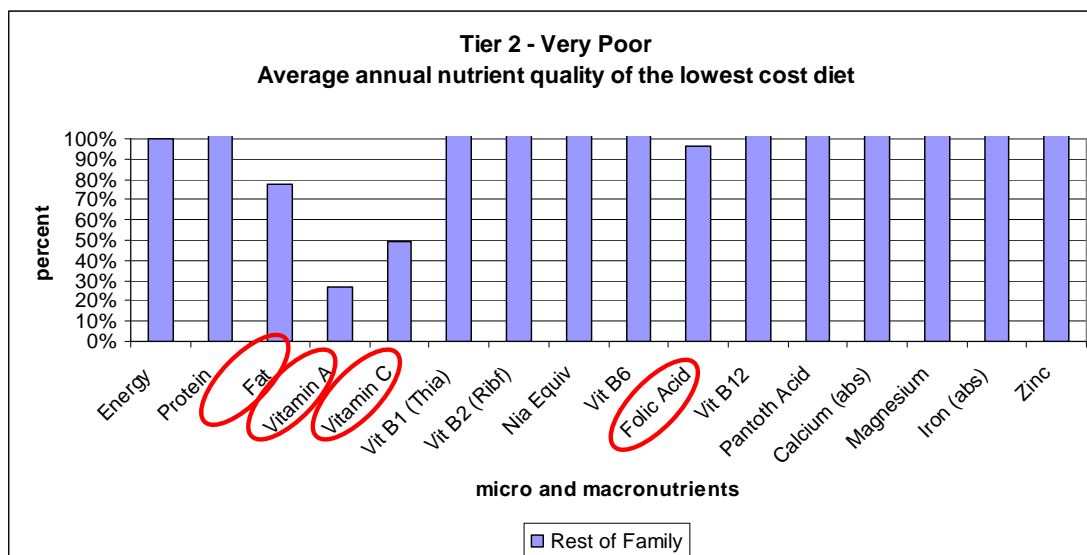


Table 23 Required grams per day selected using tier 2 – very poor household

	Cold	Hot	Rainy
	Grams / week	Grams / week	Grams / week
Breast milk	532	532	532
Millet	1606	1226	1263
Bread	197	197	197
Pasta	0	122	122
Wheat	0	155	155
Sweet potato	88	88	88
Peanut	158	142	126
Cowpea	106	106	106
Butter	34	34	34
Sunflower oil	19	51	51
Butter	35	35	35
Powdered Milk	92	92	92
Buttermilk	6702	6702	6702
Mutton	51	53	53
Mutton offal	1	0	0
Egg	70	70	70
Fish fresh	211	211	211
Fish dried	211	211	211
Pumpkin	264	264	0
Tomato	0	70	0
Onion	53	53	53
Okra (dried)	53	53	53
Dates	0	69	70

4.2.3 Scenario Modelling

In order to test different ways in which to ensure the cost was based on diets which meet the requirements different scenarios were tested where different foods were introduced or increased frequency were allowed. In order that almost all requirements were met for all household members the following changes were made to the diet, the inclusion of fruit was only during the rainy season when availability allowed it:

- 1) Meat, Poultry, Fish and Eggs were allowed to be included twice a day this was to try and increase the iron and fat content of the diet
- 2) Orange sweet potato replaced the white/purple sweet potato in order to try and improve the availability of vitamin A in the diet.
- 3) Mango, mandarin and guava was introduced into the available foods list when they were seasonally available (rainy season) and were permitted to be selected once per day, this was to increase the vitamin A and vitamin C content of the diet.
- 4) Increase the frequency of cowpea in the diet to improve the availability of folate and iron in the diet.

These changes were made to explore *realistic* changes which could take place and as a result just 2 requirements were still not quite being met for the 12 – 23 month old, the folate content was just below at 94-95% and the iron requirement in the cold season at 95%. Therefore the 4th change was made and the frequency with which cowpea' could be included into the diet was increased (up to 5 times per week) enabled the diets to meet all the requirements. Although mango, guava and mandarin are only available to buy when the boat stops in Téméra and therefore only when there is sufficient water in the river (rainy season and beginning of cold) it does demonstrate that there is a degree of access to these food items and therefore potential for strategies which would increase their presence on the market as well as interventions to allow household to improve their ability to afford them. Table 24 shows the foods grams per day which each food item would need to be consumed in order to meet all the requirements, although the milk consumption is still quite high the portion sizes are much more realistic and this does demonstrate the kind of diversity which household would require from their diet if they were going to achieve adequate intake. Most notable is the inclusion of meat products, eggs and fruit and vegetable as well as wild foods when they are available.

The tier 2 scenario diets with increased frequencies of foods are unaffordable at present however the diet quality is markedly improved and all requirements are now met, as can be seen in figure 32 and 33.

Figure 32

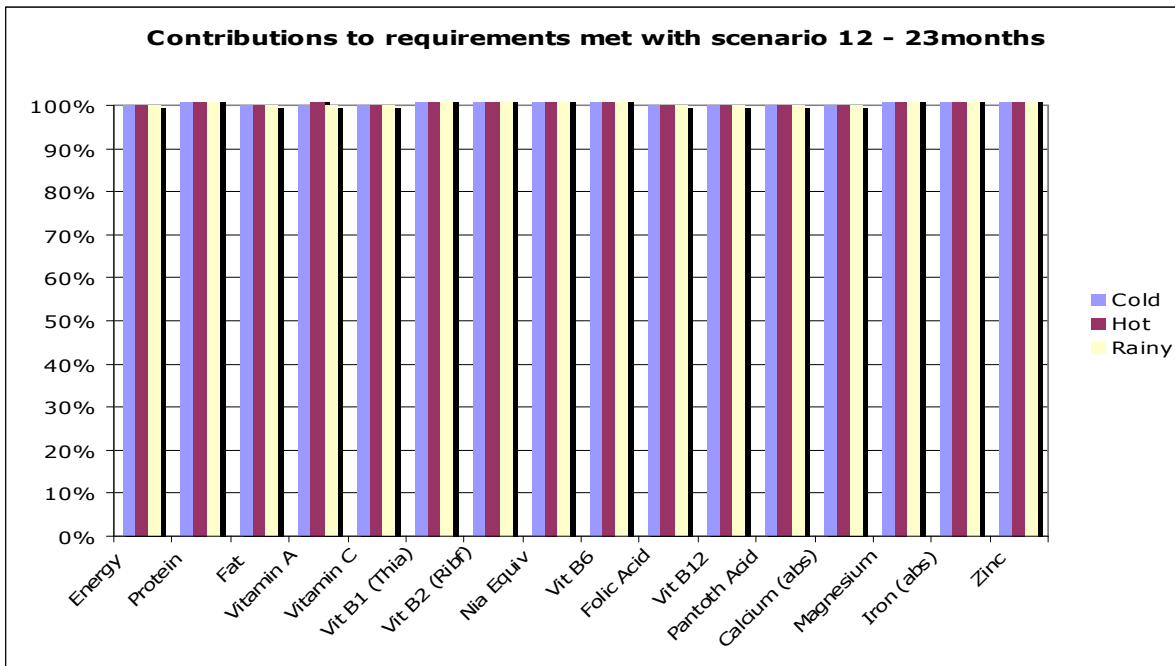
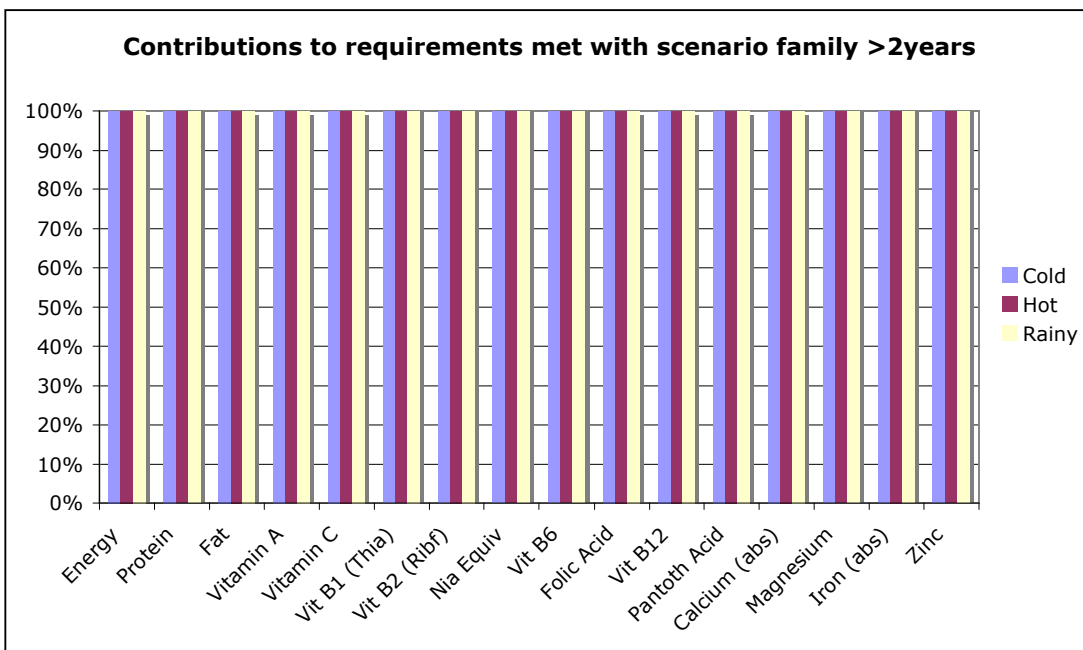


Figure 33



Despite fruits only being included in the rainy season the vitamin A and vitamin C requirements could still be met in the scenario modelling due to the increased inclusion of jujube and the replacement of white/purple sweet potato with the vitamin A rich variety. The inclusion of jujube and cram as free foods also had an impact on the diets, enabling essential micro and macro nutrients to be available free of charge.

Table 24 Servings per week required in scenario model for whole household.

	Cold g/day	Hot g/day	Rainy g/day
Breast Milk	532	532	532
Millet	1270	1608	1603
Sorghum	-	23	-
Bread	192	197	197
Peanut	141	108	119
Cowpea	182	156	148
Shea Butter	34	35	35
Sunflower Oil	51	51	51
Powdered Milk	88	88	92
Buttermilk	561	3602	4337
Mutton	355	368	367
Beef (medium fat)	-	370	-
Beef (no fat)	-	-	370
Beef (High fat)	367	-	-
Goat	-	355	355
Fish (Dried)	246	10	1
Jujube	173	132	-
Guava	-	-	46
Fonio	250	-	-
Cram Cram	253	-	-
Onion (dried)	53	53	53
Sweet potato (red / orange)	438	429	425
Daily CoD (CFA)	1,748	1,906	2,068
Daily average income (CFA)	624	624	624

Figure 34 demonstrates that daily income for a very poor household is less than 1 tenth of what would be required to afford this more diverse diet which is closer to meeting the requirements of the household. When designing an appropriate intervention package this finding needs to be heeded as any behavioural change approach which aims to encourage households to diversify their diets will not be effective if it is not combined with strategies to enable households to better access these foods. This could be in terms of economic access, ensuring they are more affordable through improving income or by some other means, through home production for example. Figure 35 illustrates the degree by which a household income would have to increase in order to be able to afford the minimum cost of a diet which meets all the requirements.

Figure 34

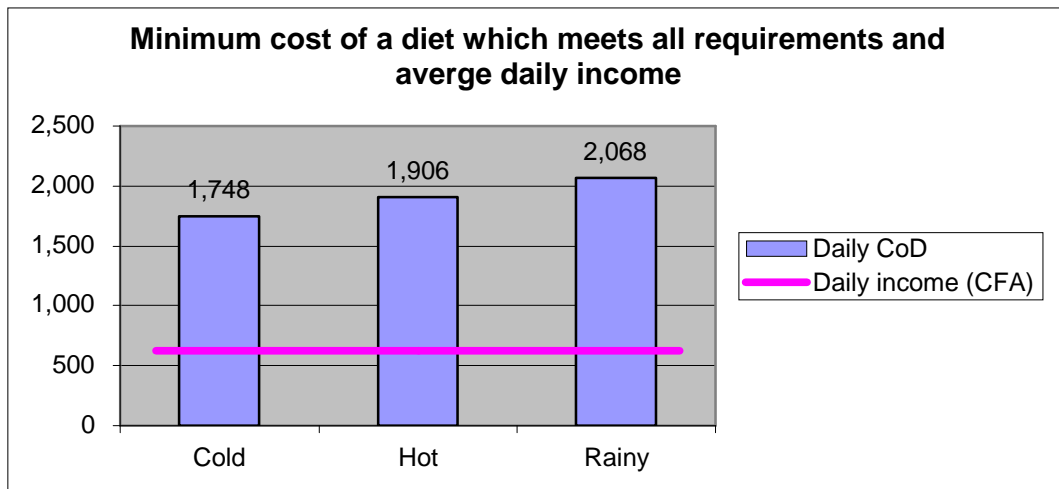
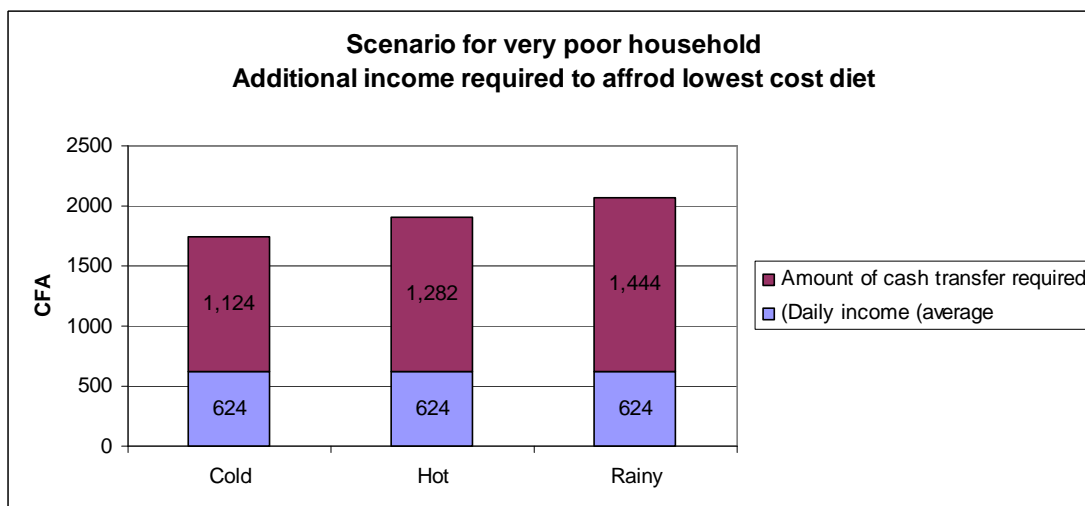


Figure 35



Figures 36, 37 and 38 demonstrate the proportion of the total cost that would be attributed to each food group in each season, highlighting that meat, poultry, fish and eggs and the dairy category are the most expensive however these are the foods which are the most nutrient dense, contributing to the overall requirements. This also reinforces the message that when households have insufficient income to cover all their requirements the purchasing priority are the cheapest foods, those which are bulky and provide the feeling of being full such as cereals. The more expensive goods such as meat, dairy (in a non pastoral setting), fruit and vegetables are therefore not commonly eaten meaning therefore risking micronutrient deficiency, which can lead to long-term ill health and poor development.

Figure 36 Cost by food group for family >2years Cold Season

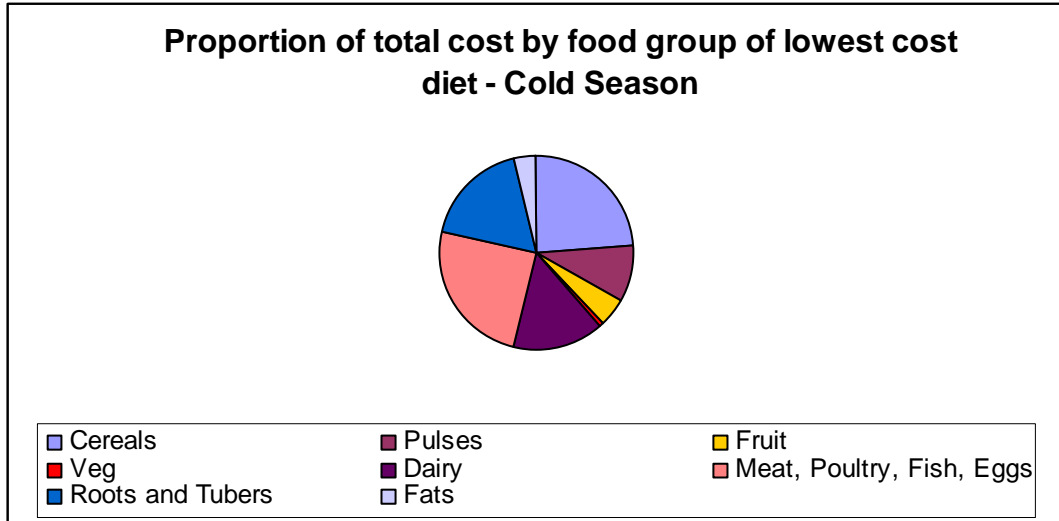


Figure 37 Cost by food group for family >2years – Hot Season

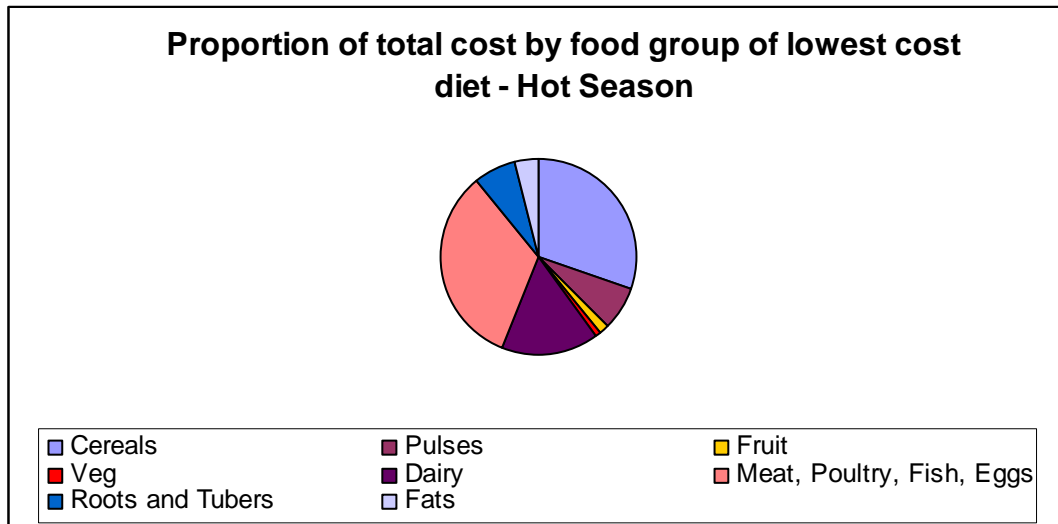
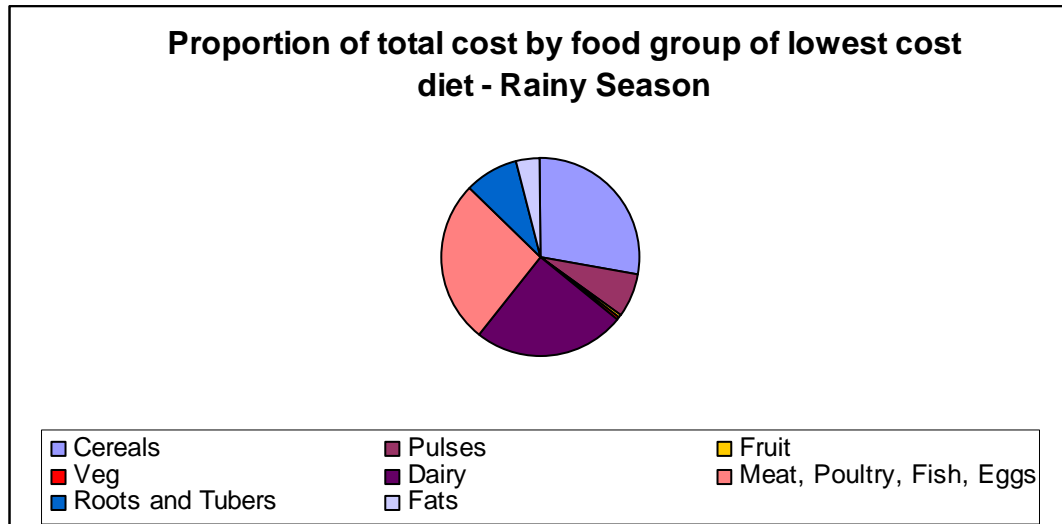


Figure 38



4.3

Téméra Discussion

The 2 issues of quality and cost are the primary area of discussion with regards to households in Téméra being able to access a nutritious diet. Any intervention in this livelihood zone will need to address both the issue of affordability and diet quality if any impact is going to be made on household food security and nutrition related health and wellbeing. Sensitization could also happen if introducing different seeds, such as orange sweet potatoes instead of white.

From the tier 1 results it is very clear that the current levels of income are not sufficient to afford the lowest cost diet available locally whilst also purchasing the household items, which a family require even when the lowest cost of the diet demonstrated by tier 1 is not palatable and could not be reasonably consumed by a household. For example the diets selected for the hot season, where the range of foods available is more limited than the cold have had to include large quantities of eggs in order to make substantial contributions to the protein, riboflavin, zinc and retinol equivalent (amongst others). A daily amount of 1597g of egg for a household of 7 is not a realistic amount to be able to consume.

If the cost was to be calculated on what is feasibly consumed then the cost could be expected to be even higher. However, even when we could not reasonable expect a household to consume food quantities as selected by the programme, household income is insufficient to cover the food expenditure cost. On this basis we can make an assumption that a diet which a household can afford is likely to be off lower nutrient density and therefore some nutrient requirements are not being met.

This is concurrent with a household's general need to fill up on energy dense but nutrient light bulky food meaning that the staple food or rice or millet is consumed in place of more expensive highly nutrient foods such as meat and vegetables.

As is shown in the results for tier 1 cereals and staple foods (maize millet and fonio) are the key provider of energy and fat coming from dairy, eggs and fats. For the 12 -23month child that is breastfed as well as receiving complementary foods zinc and iron are known to be difficult nutrients to secure sufficient intake of. The tier 1 diets selected 90grams of millet in which provided the majority of the zinc and iron content sufficient to meet the requirements.

The results for tier 1 do demonstrate the foods which provide the correct balance of macro and micronutrients for all members of the household with their unique requirements are available locally in Téméra. Tier 1 diets also showed the importance on wild or free foods which can be collected free of charge and consumed by the household. For example in the cold season the energy content of the diet is provided solely from fonio as it is available at no cost (wild).

The tier 2 analysis aimed to explore the quality of the best possible diet that can be selected from the foods available locally if they are eaten in broadly the same pattern as they are currently being eaten. That is that if no behaviour change was to take place. Tier 2 analysis is emphasising that the best possible diets are potentially deficient in Vitamin A, C, and folic acid, Iron and in everyone but the 12-23month olds, fat. In order to explore how diets would need to change in order to meet the nutrient requirements of a household different scenarios were modelled and the impact on quality and cost highlighted. In order to meet the requirements fresh fruit was made available, these food items are currently available in Gao market but not in the markets of Téméra so issues of availability would need to be addressed as well as affordability. In order to improve the vitamin A content of the diet the sweet potato which was included into the diet was orange sweet potato as opposed to the white variety which is usually found in Téméra. This is one example of how a food based strategy, working with the community to make changes in the variety of foods they produce can have an impact. This has the greatest impact in the rainy season when sweet potato is the cheapest available source of vitamin A. The meat, poultry, fish and egg consumption was also increased in order to meet the iron and fat content of the diet.

In order to address the issues of diet diversity and income a dual approach would be necessary. As income is clearly a barrier to accessing a more diverse diet for the poorest households in Téméra a behavioural change intervention alone would not have sufficient impact on the quality of the diets. Whilst there are some more nutritious foods available in Téméra such as fruits, vegetables and meat products they are not widely available and certainly are unaffordable. In order to improve access to fruits and vegetables small scale home or community gardens could be set up, alongside nutritional education. However this approach may have certain limitations as households may prefer to sell the produce instead of consuming it during periods of low income.

A fruits and vegetable voucher scheme is one potentially viable option. The distribution of vouchers which could only be spent to purchase fruits and vegetables would go some way to increasing the consumption of these foods and therefore increasing the quality of the diet in the problem nutrients (as exposed by tier 2 analysis). The intervention would have to work closely with traders to increase the diversity of food types entering the zone.

Agricultural diversification specifically to encourage the growth of orange variety of sweet potato instead of the white sweet potato would increase household exposure to a vitamin A rich product. Efforts also need to be made to mitigate the vulnerability of households during the lean period when access to some of the communities and markets is limited. Encouraging the long term storage of food through cereal banks may be one way in which this can happen.

In Téméra however the results do show that there is a wider range of foods available than perhaps households are currently accessing and the disparity between income and cost of these foods is clearly a barrier. Increasing cash flow into the household through cash transfers may be one short term solution in preparing household for the lean period when their capacity to generate income is decreased.

5. Comparison of Tarkint and Téméra

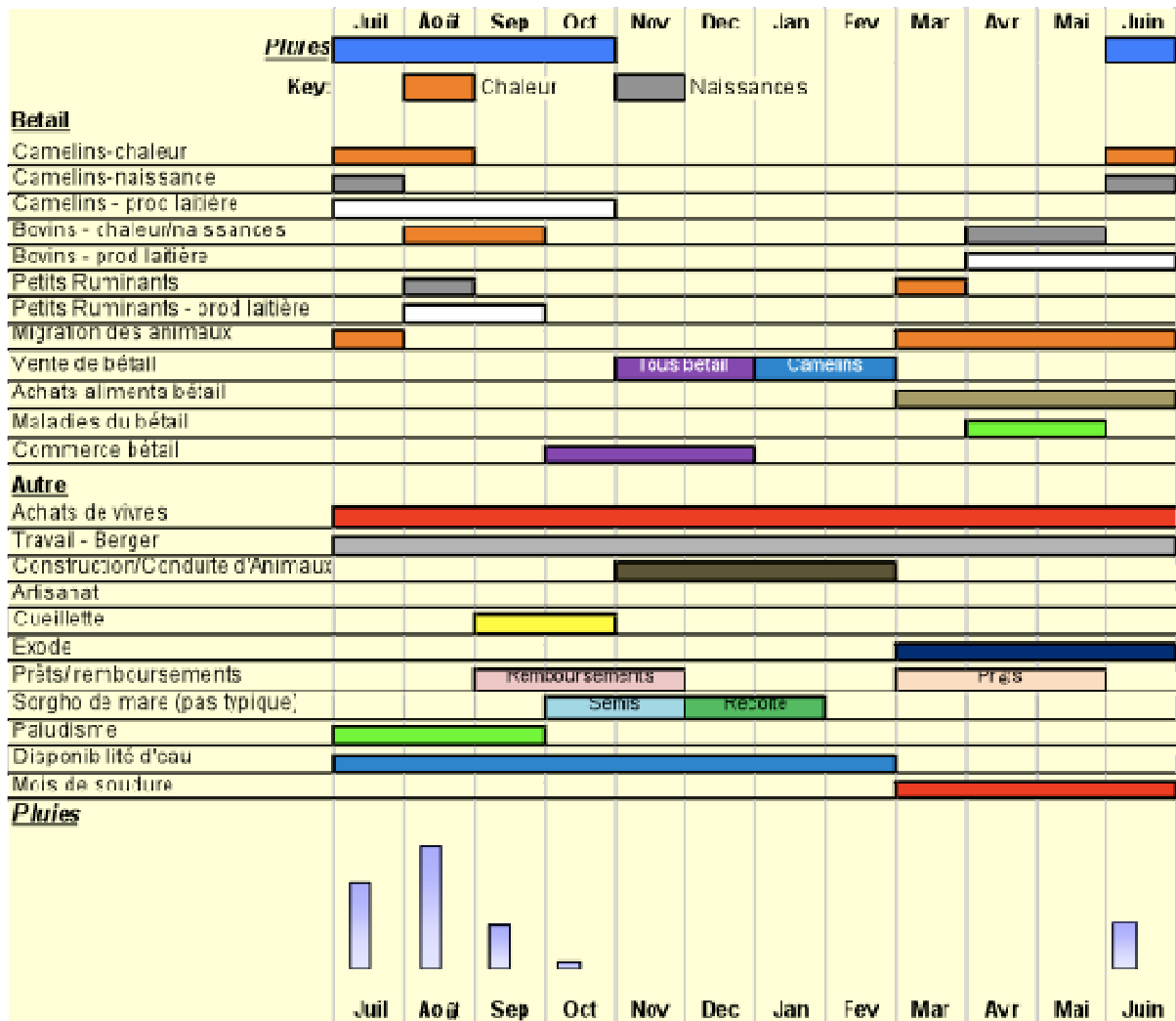
Téméra and Tarkint have very different issues when it comes to accessing a sufficiently adequate diet throughout the year. What these results do show however is that it is an issue of both affordability and quality and therefore any intervention needs to approach both of these aspects in unison.

Taking this forward the results can hopefully inform the direction that any intervention takes in the region. Consultation with the communities in order to design and promote an effect strategy is essential in order to assure that any intervention is well accepted. The cultural context surrounding food, what people chose to eat and how is well established and any food based intervention has to be well accepted to ensure success. Sustainability of any intervention must also be considered. Short term approaches may provide a relief during the hunger season however without a long term approach household will become more vulnerable for longer periods of time as they have to resort to detrimental coping strategies such as the sale of assets.

Now that there is some knowledge and experience of CoD within the teams across many different partners the methodology can be used in an ongoing fashion to assist in the monitoring of the food security situation. With monthly or seasonal data collection a more accurate and current picture can be built up. The vulnerability of household to food insecurity is highly dependant on the increasing food

prices, with ongoing collection of this data the results can feed into an early warning system which can alert a well informed response.

Annexe 1
HEA Seasonal Calendar – Tarkint



Annexe 2

Tarkint – Generic portion size and frequency data which used.

Portion size based on 12-23month old and scaled up for all other household members.

FOOD LIST	Portion Size (in grams)	Number of Times Eaten Per Week	
		Min	Max
Cereals		14	14
Pulses		0	0
Fruit		0	3
Veg		0	7
Dairy		3	14
Meat, Poultry, Fish, Eggs		0	3
Roots and Tubers		0	0
Fats		6	14
Manufactured		0	4
Beverages		0	0
Condiment Vegetables		0	0
Sugars		0	0
Snacks		0	0
Supplement		0	0
Breast Milk	532	7	7
BREAST MILK (GENERIC)	532	7.0	7.0
RICE, LOCAL, PADDY (INDIA)	36	0.0	7.0
MILLET, WHOLE GRAIN (SENEGAL)	36	0.0	14.0
SEMOLINA (EGYPT)	36	0.0	0.0

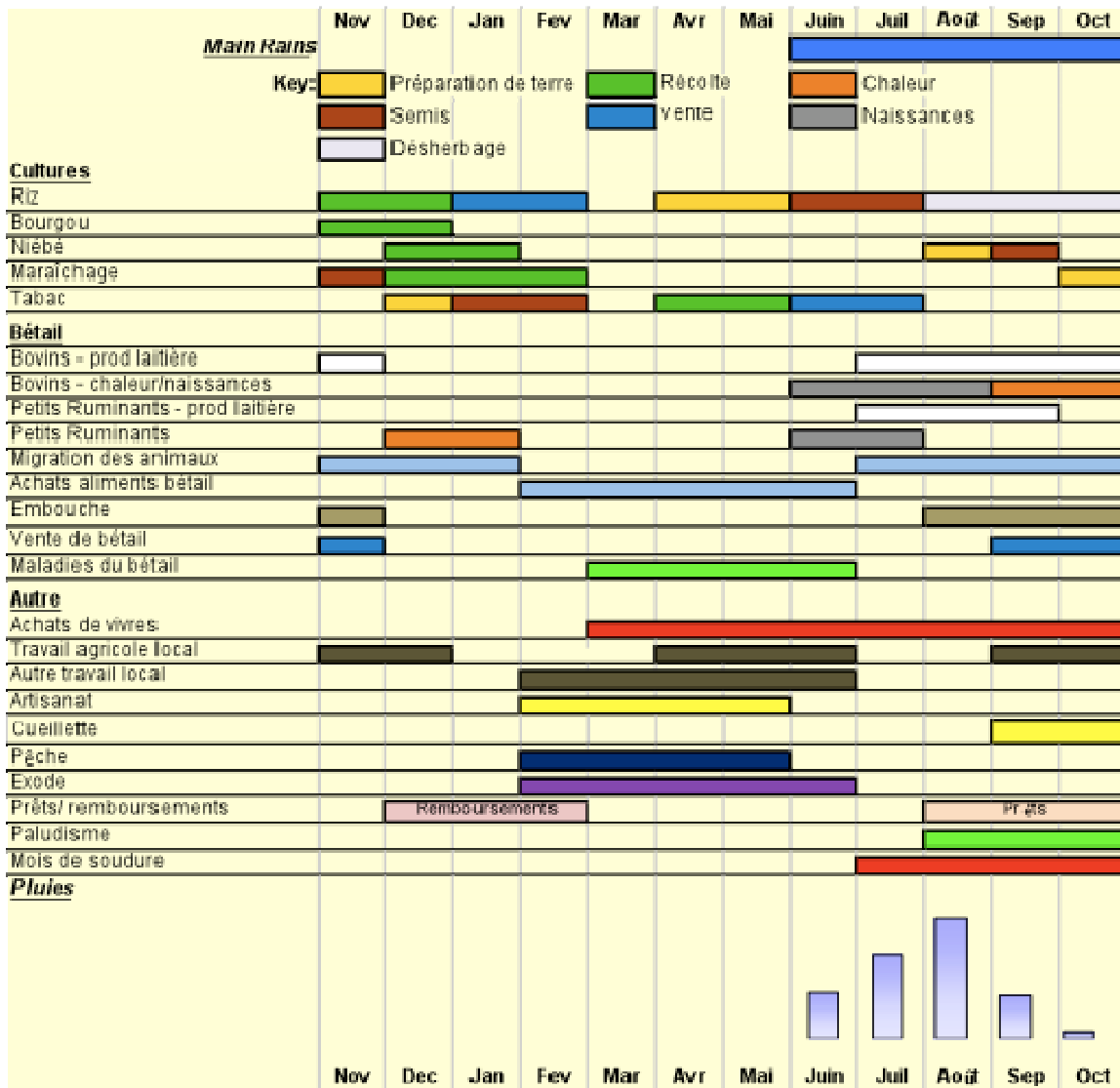
MACARONI (SENEGAL)	36	0.0	1.0
MAIZE, WHOLE KERNEL, DRIED (SENEGAL)	36	0.0	0.0
FONIO, WHOLE GRAIN (SENEGAL)	36	0.0	0.0
PEANUT, W/O SHELL (INDONESIA)	15	0.0	0.0
SAFFLOWER OIL (INDIA)	5	0.0	14.0
BUTTER, COW, UNCOOKED (SENEGAL)	5	0.0	0.0
MILK, GOAT, FRESH, WHOLE (SENEGAL)	136	0.0	1.0
MILK, CAMEL (MALI)	136	0.0	14.0
MILK, COW, PWD, WHOLE (KENYA)	26	0.0	0.0
BUTTERMILK (INDIA)	136	0.0	14.0
FISH, SARDINES, CANNED IN OIL (INDONESIA)	10	0.0	0.0
SUGAR, REFINED (MEXICO)	5	0.0	2.0
DATE, BLACK, DRIED (EGYPT)	42	0.0	0.0
MUTTON, MEAT (INDONESIA)	15	0.0	1.0
DATE, BLACK (EGYPT)	42	0.0	1.0
0			

Annexe 3
Table of composition for CSB plus plus

	Per 100g
Energy	420Kcal
Protein	16g
Fat	9g
Vitamin/Mineral FBF-V-10	
Vitamin A	1,664 IU
Thiamine	0.128 mg
Riboflavin	0.448 mg
Niacin	4.8 mg
Pantothenic acid	6.7 mg
Vitamin B6	1.7 mg
Folate	60 mcg
Vitamin B12	2 mcg
Vitamin C	100 mg
Vitamin D	4 mcg
Vitamin E	8.3 mg
Vitamin K	100 mcg
Iron (a)	4 mg
Iron (b)	2.5 mg
Zinc	5 mg
Iodine	40 mcg
Carrier	qs
Other minerals	
Calcium (a)	470 mg
Potassium	400 mg
Phosphorus	200 mg
+ Calcium (b)	130 mg

Annexe 4
Nutrition Composition of CSB Plus

**Annexe 5
HEA Seasonal Calendar Téméra**



Annexe 6

Tier 1 – Téméra Breakdown of CoD by season and household member

		Cold	Hot	Rainy
		Daily CoD in CFA	Daily CoD in CFA	Daily CoD in CFA
Better Off	12 -23month	162	166	183
	Rest of Family	3714	4195	4344
	Overall	3876	4361	4527
Middle	12 -23month	162	166	183
	Rest of Family	2698	3051	3158
	Overall	2860	3217	3341
Poor	12 -23month	81	83	91
	Rest of Family	2533	2860	2966
	Overall	2614	2943	3057
Very Poor	12 -23month	81	83	91
	Rest of Family	1683	1834	1917
	Overall	1764	1917	2009

Annexe 7

Tier 2 – Téméra Breakdown of CoD by season and household member

		Cold	Hot	Rainy
		Daily CoD in CFA	Daily CoD in CFA	Daily CoD in CFA
Better Off	12 -23month	231	210	191
	Rest of Family	6445	6757	6304
	Overall	6675	6967	6495
Middle	12 -23month	226	209	191
	Rest of Family	4548	4723	4342
	Overall	4774	4932	4533
Poor	12 -23month	111	100	91
	Rest of Family	4100	4261	3937
	Overall	4211	4361	4028
Very Poor	12 -23month	111	100	91
	Rest of Family	2555	2693	2476
	Overall	2,666	2,793	2,568

Annexe 8

Téméra – Generic portion size and frequency data which used.

Portion size based on 12-23month old and scaled up for all other household members.

FOOD LIST	Portion Size (in grams)	Number of Times Eaten Per Week	
		Min	Max
Cereals		7	21
Pulses		1	7
Fruit		0	7
Veg		1	14
Dairy		0	16
Meat, Poultry, Fish, Eggs		1	14
Roots and Tubers		0	6
Fats		0	9
Manufactured		0	14
Beverages		0	0
Condiment Vegetables		0	0
Sugars		0	0
Snacks		0	0
Supplement		0	0
Breast Milk	532	7	7
BREAST MILK (GENERIC)	532	7.0	7.0
MILLET, WHOLE GRAIN (SENEGAL)	36	0.0	21.0
SORGHUM, WHOLE GRAIN (SENEGAL)	36	0.0	6.0
MAIZE, WHOLE KERNEL, DRIED (SENEGAL)	36	0.0	4.0

BREAD, CRISPY FRENCH OR CRUMBS (EGYPT)	28	0.0	2.0
PASTAS (MEXICO)	36	0.0	1.0
WHEAT, FLOUR (INDONESIA)	23	0.0	2.0
RICE, LOCAL, PADDY (INDIA)	36	0.0	14.0
RICE, WHITE, MILLED (INDONESIA)	36	0.0	6.0
POTATO, WHITE (EGYPT)	25	0.0	0.0
SWEET POTATO, PURPLE (INDONESIA)	25	0.0	1.0
YAM, WINGED, FRESH (SENEGAL)	25	0.0	0.0
PEANUT, ROASTED, SHELLED (SENEGAL)	15	0.0	0.0
PEANUT, W/O SHELL (INDONESIA)	15	0.0	3.0
COWPEA, WHOLE DRIED (SENEGAL)	15	0.0	2.0
BUTTER, SHEA-BUTTERSEED (SENEGAL)	5	0.0	2.0
SAFFLOWER OIL (INDIA)	5	0.0	3.0
BUTTER, COW, UNCOOKED (SENEGAL)	5	0.0	2.0
MILK, COW, POWDERED, WHOLE (SENEGAL)	26	0.0	1.0
BUTTERMILK (INDIA)	136	0.0	14.0
MILK, GOAT, FRESH, WHOLE (SENEGAL)	136	0.0	14.0
MUTTON, MEAT (INDONESIA)	15	0.0	1.0
BEEF, MEDIUM FAT, RAW (KENYA)	15	0.0	0.0
BEEF, W/BONE (SENEGAL)	15	0.0	0.0
BEEF, HIGH FAT, W/BONE (MEXICO)	15	0.0	0.0
GOAT, FRESH, W/BONE (SENEGAL)	15	0.0	0.0
SHEEP, TRIPE (SENEGAL)	8	0.0	1.0
BEEF, INNARDS (MEXICO)	8	0.0	0.0
GOAT INTESTINES & STOMACH, RAW (KENYA)	8	0.0	0.0
CHICKEN, CLEAN, READY TO COOK (SENEGAL)	15	0.0	0.0

EGG, CHICKEN, WHOLE, LOCAL (EGYPT)	20	0.0	1.0
FISH, CARP, RAW-EP (SENEGAL)	10	0.0	6.0
FISH, CATFISH AND OTHER FRESHWATER FISH (INDONESIA)	10	0.0	0.0
FISH, DRIED, FRESH WATER (MEXICO)	10	0.0	6.0
PUMPKIN (EGYPT)	25	0.0	3.0
TOMATO, RIPE (INDIA)	10	0.0	2.0
ONION, FRESH (SENEGAL)	5	0.0	3.0
CABBAGE, FRESH-EP (SENEGAL)	10	0.0	0.0
OKRA, DRIED (SENEGAL)	5	0.0	3.0
ORANGE (INDIA)	15	0.0	0.0
DATE, RED, DRIED (EGYPT)	10	0.0	2.0
WATERMELON (EGYPT)	25	0.0	0.0
MELON, AVERAGE (MEXICO)	25	0.0	0.0
JUJUBE, FRESH (SENEGAL)	25	0.0	3.0
MANDARIN ORANGE (EGYPT)	15	0.0	0.0
GUAVA, FRESH (SENEGAL)	15	0.0	0.0
MANGO, RIPE, FRESH-AP (SENEGAL)	15	0.0	0.0
TOMATO, CONCENTRATE 28% (SENEGAL)	5	0.0	0.0
FISH, SARDINES, CANNED IN OIL (INDONESIA)	10	0.0	0.0
SUGAR, REFINED (MEXICO)	5	0.0	8.0
CASSAVA/TAPIOCA, FLOUR (INDONESIA)	23	0.0	0.0
FONIO, WHOLE GRAIN (SENEGAL)	36	0.0	2.0
CRAM CRAM (MALI)	36	0.0	2.0
CUCUMBER (EGYPT)	10	0.0	0.0
ONION DRIED (MALI)	5	0.0	3.0