FACTORS THAT INFLUENCE THE NUTRITIONAL STATUS OF CHILDREN IN WET AND DRY SEASONS AMONG THE PASTORALISTS IN WEST GOLIS-GUBAN, SOMALIA

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DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT FOR THE DEGREE OF MASTER OF SCIENCE IN APPLIED HUMAN NUTRITION OF THE UNIVERSITY OF NAIROBI

MAY 2016

DECLARATION

I hereby declare that this dissertation is my original work and has not been presented for a degree in any other university

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I dedicate this work to my parents **Mr. J.A.O Masese and Mrs. R.M Masese** for their tireless, emotional, moral, and financial support and also for their love and encouragement.

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LIST OF ABBREVIATIONS

ARI	Acute Respiratory Infection
CI	Confidence Interval
DD	Dietary Diversity
ENA	Emergency Nutrition Assessment
ENA for SMART	Emergency Nutrition Assessment Software for SMART
FAO	Food and Agriculture Organization
FGD	Focus Group Discussion
FSNAU	Food Security and Nutrition Analysis Unit
FEWS-NET	Famine Early Warning Systems
GAM	Global Acute Malnutrition
HAZ	Height for Age Z Score
HDDS	Household Dietary Diversity Score
HH	Household
IDP	Internally Displaced Person
IFAD	International Fund for Agricultural Development
IOM	International Organization for Migration
IUCN	International Union for Conservation of Nature
KAP	Knowledge, Attitudes and Practices
MOH	Ministry of Health
MUAC	Mid Upper Arm Circumference
PPS	Probability Proportionate to Size

SAM	Severe Acute Malnutrition
SUCK	Save the Children UK
SL Sh	Somaliland Shilling
SLIMS	Somali Livelihood Indicator Monitoring System
SMART	Standardized Monitoring and Assessment of Relief and Transitions
SPSS	Statistical Package for Social Science
TOT	Terms of Trade
UNICEF	United Nations Children's Education Fund
UNDP	United Nations Development Programme
WAZ	Weight for Age Z Score
WFP	World Food Program
WHO	World Health organization
WHZ	Weight for Height Z Score

OPERATIONAL DEFINITION OF TERMS

Abnormal migration – When pastoralists, mostly men and young boys, migrate out of their regions during abnormally harsh climatic conditions, mainly outside their normal migratory routes due to extremely limited access to pasture and water for their livestock. Women, girls and children are typically left behind with a lactating animals for milk production.

Access to a health facility- Is the ability for the respondent to access a health facility and its services, including physically and also ability to receive the services either free or by paying. The indicator is the proportion of individuals who reported to have physical access and financial ability to access health services.

Agro-pastoralism- The practice of both growing of crops and raising of livestock as a livelihood.

Cluster- In this study was a village, it is the smallest defined administrative unit with a known population estimate, the cluster is the sampling unit used in cluster sampling.

Diarrhoea- When a child passes loose/watery stool three (3) or more times in a day.

Dietary Practices – Dietary diversity and meal frequency were the dietary practices measured. Dietary diversity is the number of food groups consumed in a day by a household, meal frequency is the number of meals consumed.

Drought/Dry Season- A period of below-average rainfall in an area or region, resulting in prolonged shortages of water supply or surface or ground water.

Household Dietary Diversity Score- This is a measure of the household's access and consumption to a diverse diet. It is the total number of food groups consumed by a household in 24 hours. The score is the number of food groups consumed by a household out of the 12 possible food groups.

Household Food Consumption- This refers to the foods and meals consumed at household level only, and gives an indication of the dietary intake of the household members.

Malnutrition – The lack of proper nutrition. In the context of Somalia, malnutrition largely refers to undernutrition in the form of macro and micro nutrient deficiencies.

Normal migration - When the entire household (usually pastoral or agro-pastoral) will migrate together, distances will not be unusually long and conditions not harsh for the women and children in search of pasture and water for the animals.

Overall Morbidity- Refers to the total incidence or prevalence of all diseases assessed in the study population.

Pastoralists - An individual who herds livestock, often nomadic moving from one place to another in search of water and pasture for his livestock.

Wet Season/ Gu Season- The rainy season, is the time of year when most of the region's annual rainfall occurs. It usually lasts from April to June.

ABSTRACT

The nutritional situation of Somalia's pastoral population remains vulnerable, the key causes of malnutrition are limited nutrient intake and high disease prevalence. This study set out to determine the key factors that influence the nutritional status of children aged 6-59 months, within the West Golis-Guban pastoral livelihood in a dry and wet season. Cross sectional nutrition surveys were conducted in the wet and dry season of October 2008 and July 2009, collecting information on anthropometry, food consumption, child feeding and morbidity. A total of 535 and 772 children were assessed in the dry and wet season respectively. Data was mainly collected using a standard household forms. Data was analysed using ENA and SPSS software packages. Chi Square tests was used to test significance and associations, logistic regression was used for testing the relationship between categorical variables and relevant independent variables, P value for statistical significance was set at <0.05. The prevalence of global acute malnutrition during the dry season was 22.3%, with 6.6% being severely malnourished. These rates were significantly lower (p=0.006), in the wet season (13.3% and 2.5% respectively), indicating lower levels of acute malnutrition in the wet season. The common foods consumed in both season was cereals, sugar and oils, dietary diversity as better in the wet season with vegetables, milk and pulses consumed in addition to the common foods. A higher proportion of households (86.5%) consumed a diverse diet (≥ 4 food groups) during the wet season compared to the dry season (76.4%). A significantly higher (p= 0.000) proportion of households consumed milk during the wet season (60.4%) compared to the dry season (33.5%). Regression analysis showed a positive relationship between household dietary diversity score and weight for height z scores in the wet season. There was no difference in the proportion of children aged 6-24 months breastfeeding in the wet (49.1%)

and dry season (48.9%). Only 13.5% and 12.7% of children in the dry and wet seasons respectively were consuming five or more meals a day, child feeding practices did not vary between seasons. Morbidity was reported at 37.4% in the dry season and 16.2% in the wet season, children had been ill, mainly with diarrhoea, ARI in the dry season, and malaria in the wet season. There was a statistically significant (p=0.001) difference in the proportion of children who fell ill in the dry and wet seasons. There was also an association between morbidity and acute malnutrition, with children being 1.72 and 3.95 times more likely to be malnourished in the dry and wet season respectively.

The study concludes that nutritional status of children is poorer in the dry season. The main foods consumed are cereals, sugar and oil in both seasons. Dietary diversity is better in the in the wet season as it also includes vegetables, pulses and milk. Morbidity especially diarrhoea, ARI and malaria are the main diseases that affect children in both seasons. Malaria is higher in the wet season. Therefore interventions that ensure access to dietary diversity at all times, such as ensuring adequate feeds and water to livestock all year round to enable pastoralists to have adequate milk supply or income through sales of animal products to purchase nutritious foods especially milk should be implemented. In addition, programmes that reduce diseases among the children in both seasons is important, for example increasing access to consumption of safe water, immunization and malaria control are important. Interventions designed to improve child feeding practices (breastfeeding and complementary feeding) should also be implemented.

CHAPTER ONE: INTRODUCTION

1.1 Background Information

Somalia is mainly made up of different livelihood zone systems, namely Pastoralist, Agro-pastoralist, Riverine, Urban and Internally Displace Persons (IDP). Pastoralism is the largest in Somalia, and is made up of various pastoral livelihood zones defined by the region and the type of livestock reared. In the West Golis/Guban pastoralist livelihood zones the pastoralists mainly rely on sheep, goats and camel. There are two main seasons in the year namely, *Jilaal* (January- May), it is at this time the *Hays* rains of January occur, the second season is the *Gu*, the dry June-December season (FSNAU, 2004). Pastoralists mainly rely on the seasonal rains for adequate water and pasture for their livestock. The livestock are reared for both subsistence and commercial purposes, providing the households with meat, milk and income from sale of animals and animal products.

Due to their exceptional cultural, social, political and geographic set up, pastoralists are often disadvantaged from general social development. This is because they are often mobile in search of water and pasture for their livestock. Therefore not able to access quality basic health and social services (Young, 2013). Therefore, the nutrition and health status/care among pastoral populations remains wanting. Often, the most health basic requirements cannot be met, due to the limited accessibility of health care provisions to pastoralists. This leads to major problems to the wellbeing of the pastoral populations, many of whom are already coping with the effects caused by bad climatic circumstances, illiteracy and poverty (Duba *et al.*, 2001).

Malnutrition rates of children in pastoral areas in Sub Saharan Africa are usually reflect a high number of children vulnerable to malnutrition. (Sadler et al 2009). However, there is still limited documented information on the causes of malnutrition among the pastoral populations and how these possible factors differ during the drought and wet seasons. A common observation of the nutritional status of children assessed during regular nutrition surveillance activities in Somalia, is that the nutritional status of children from pastoral areas seem less vulnerable to short-term declines in food availability, that is during seasonal changes in milk and food availability, and recover more quickly after a dry season than their agro-pastoral and riverine counterparts. The pastoral livelihood is more resilient to seasonal variations as milk yields increase much more quickly than food production from cereals once rains arrive (FSNAU, 2009).

1.2 Problem Statement

Somalia, over a long period, has experienced with a high number of both natural and man-made emergencies such as floods and droughts, poor governance, armed conflict, and collapse of institutions/infrastructure. This has led to disruptions in livelihood systems, limited provision of basic services and a break down in the social care network, subsequently affecting the nutrition situation in the region negatively. A meta-analysis from surveys conducted in Somalia from as early as the 1980s have constantly documented high levels of acute malnutrition, mortality rates even in seasons of improved food security. The average rates for global and severe acute malnutrition for children aged below 5 years is 15.0% and 2.9% respectively, this is according to information from 49 nutrition surveys conducted in Somalia during the period 2001-2004, indicating a critical situation according to WHO classification

for malnutrition. The average prevalence of stunting is 17% and lies at an acceptable level, while the median underweight is critical at 37%, (FSNAU, 2007). The pastoral population's nutrition situation continues to remain vulnerable, with a median wasting rate of 14.6% and a median stunting and underweight rate of 15.2% and 24.7% respectively (FSNAU, 2007). The factors causing the different types of malnutrition in Somalia may be varied across livelihoods but are not adequately documented for informed formulation and implementation of suitable interventions.

1.3 Justification of the Study

Pastoralists migrate within their region in the dry seasons in search of water and pasture, as they await seasonal rains, these are known as the normal migratory routes. When using normal migratory routes at the time of migration, the entire household will migrate hence none of the household members will be left behind and all will continue to have direct access to the livestock products such as milk, cash to buy cereals from the sale of the animals or its products. However, during seasons of consecutive rainfall failure that result in extreme water scarcity and inadequate pasture, the pastoral populations cope through abnormal migrations out of their region. When different migration routes that are not usually used are adapted, this is considered as an extreme coping mechanism, because they are often further than usual, may involve conflict for resources and are also not easily accessible. This is what is referred to as abnormal migration, and usually results in family splitting, in this case because of the risks and distance, the women, children, vulnerable such as the elderly and sick are left behind with few lactating animals whilst men and the younger boys migrate looking for adequate water and pasture for livestock. Consequently, the women, children and elderly who are left behind experience reduced purchasing power to buy foods such as cereals and milk, an in addition

now have no access to animal products they were initially obtaining from their livestock. (FSNAU, 2004). These factors coupled with lack of adequate safe water for drinking, poor sanitation and health facilities may lead to increased malnutrition cases and high morbidity incidences.

During the dry seasons, there is a high likelihood of malnutrition rates increasing. In other surveys conducted in Somalia, high rates of malnutrition have been noted during the dry season, however it is not clear if the factors affecting malnutrition during the wet season and the periods of drought are the same. If there is a significant difference in the factors associated with malnutrition in the drought and wet season, it would be important to understand these differences carefully, in order to determine if the migration patterns and its impacts on household food access and milk consumption, especially in the drier seasons, influence the nutritional status of children compared to the wet season, would help to ensure that programmes are designed accordingly.

1.4 Purpose and Objectives

The purpose of the study was to provide information on key factors that contribute to the nutritional status of children aged 6-59 months within the West Golis-Guban pastoral livelihood zone in Somalia during a wet and dry season, to be able to adequately inform stakeholders on appropriate interventions in the area. The main objective of the study therefore was to determine the factors that influence the nutritional status of children 6-59 months in West Golis-Guban livelihood zone in wet and drought seasons.

1.4.1 Specific Objectives

i. To describe the general household characteristics, sources of income for the households and access to safe water, sanitation and health facilities of the pastoral population in the West Golis-Guban pastoral population.

ii. To assess the level of malnutrition among children aged 6-59 months in the West Golis-Guban pastoral livelihood zone of Somalia during wet and drought season.

iii. To establish the common foods consumed at household level by the population of the West Golis-Guban pastoral livelihood zone of Somalia in wet and dry seasons.

iv. To assess infant and young child feeding practices among the population in West Golis-Guban pastoral livelihood zone.

v. To determine the relationship between household food consumption (household dietary diversity) and nutritional status of children aged 6-59 months in West Golis-Guban pastoral livelihood zone of Somalia during wet and dry seasons.

vi. To assess the prevalence of common diseases associated with malnutrition (measles, diarrhoea, malaria, and ARI) in children aged 6-59 months in the West Golis-Guban pastoral livelihood zone during wet and dry seasons.

vii. To determine the relationship between acute malnutrition and the prevalence of common diseases namely diarrhoea, acute respiratory infections and malaria among children aged 6-59 months in the West Golis-Guban pastoral livelihood zone using during wet and dry seasons.

1.5 Null Hypothesis

The study sought to test the following null hypotheses

H_{01} There is no significant relationship between household food consumption and nutritional status of children aged 6-59 months in West Golis-Guban pastoral livelihood zone of Somalia during wet and dry seasons

H_{02} There is no significant relationship between acute malnutrition and the prevalence of common diseases namely diarrhoea, acute respiratory infections and malaria among children aged 6-59 months in the West Golis-Guban pastoral livelihood zone during wet and dry seasons.

CHAPTER TWO: LITERATURE REVIEW

2.1 Pastoral Communities of Somalia

Pastoralists are individuals who mainly keep livestock as their main source of income, they and rely on animal sales and the sale of buy products to purchase their food and other needs. They mostly live in dry areas that are often not suitable for crop production due to the dry and climatic conditions and lack of arable soils, the health and ability of their livestock to access adequate pasture and water are of key importance to the pastoralists (IFAD, 2009). The type of livestock kept will depend on the climate and environment of the area, in Somalia, the main livestock kept by pastoralists includes camels, goats, sheep and cattle (FSNAU, SLIMS, 2005). Movement is one of the main characteristics of pastoralism, pastoralists have developed a mechanism that allows them to move in search of resources but to also consider the use of the available water and pasture and to move in such a way that allows for regeneration of pasture and fodder between the seasons. Pastoralism is an economically viable system especially in dryland conditions (IUCN, 2006), this system requires a deep knowledge of one's climatic and physical environment and surroundings. Pastoralists take care of the use of pasture and water to avoid over exploiting the land, hence why they also consider typical normal migratory routes to be sued at various times of the year, to ensure that the limited and seasonally existing resources are used appropriately. Pastoralists also have strong inter communal ties with each other, and often land is and resources such as water points, grazing lands are owned communally, this set up has put the pastoralists under pressure due to trade and land policies that do not favour this kind of set up, and also recently environmental

degradation and increased population growth limiting the amount of free land available (IUCN 2006)

Pastoralists constitute about 60 per cent of the Somali population, majority of whom reside in the north and central parts of Somalia (FSNAU, 2009). Pastoralists mainly rely on sales of livestock and its products, therefore for high sales and production, good body conditions are important and this is only possible if livestock have access to enough water and pasture. However, in recent years, pastoralism has been threatened by recurring drought, environmental degradation resulting in reduced livestock herd sizes. Such has been the case noted among the pastoral communities of the West Golis Guban pastoral livelihood zone that is located in the North of Somalia (Figure 1). In the West Golis and Guban livelihood zone there are two main seasons; the *Jilaal*, which is the season when the rains are experienced, *Hays* rains which come only once a year in the month of January is the main rainy season. The second season is called the *Gu*, This is the dry season in this area and is mainly between June and December. In the period preceding July of 2008 saw the area experience four consecutive years of poor rainfall. The West Golis and Guban pastoral livelihood zone keep mainly camel, goat and sheep. Wealth of these pastoralists is measured by herd size. Goats tend to be more resilient than sheep, in this area, successive droughts and increased livestock diseases, have reduced the number of

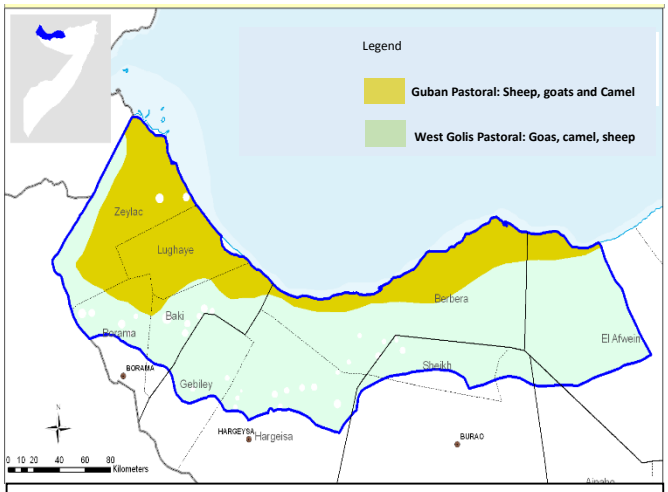

Figure 1: **The West Golis/Guban Livelihood Zones Map**

Source: FSNAU Livelihood Zone Maps

sheep particularly in the mountainous areas (FSNAU, 2004). There are limited water sources in the area, in 2008, there were only three functioning boreholes in the area (FSNAU, 2008). In periods of dryness, there is increased pressure on the limited water sources in the livelihood zone. This leads to overcrowding at water sources and also use of the same water for both livestock and domestic purposes. Shallow water wells are also dug to provide water and are often also used for both livestock and domestic purposes during the dry season. With poor rainfall, all the livestock in this livelihood zone move to the southern parts of Somaliland to the agro-pastoral livelihood zone, or they cross to the Ethiopia side in search of water and pasture (FSNAU 2004).

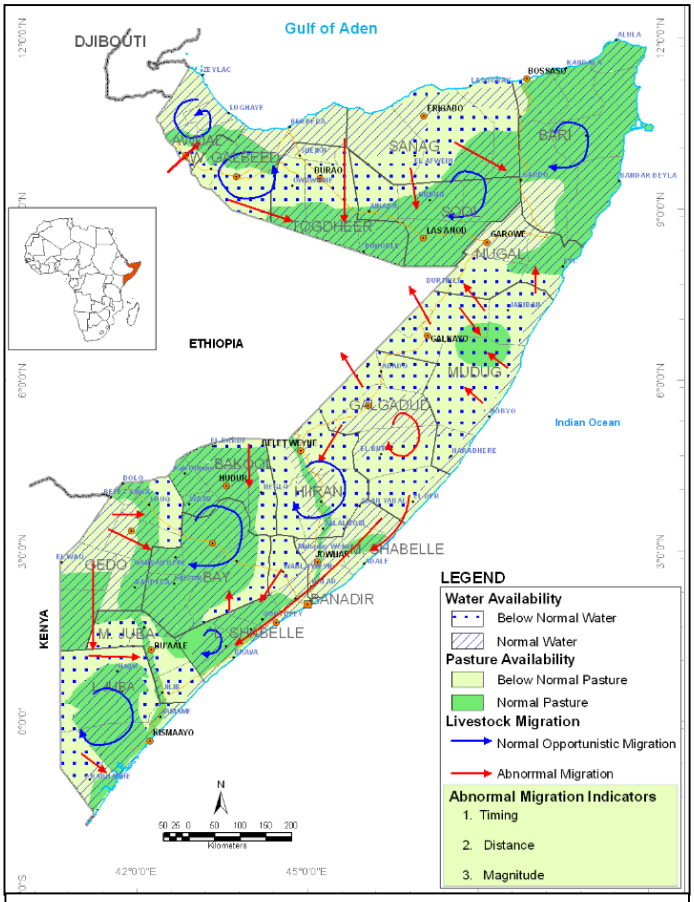

Figure 2: **Normal Migration Patterns in Somalia**

Source: FSNAU Migration Maps

The livestock market for the Golis and Guban livelihood zone is Djibouti, this is where livestock are sold and cereal and other food stuff is alo readily available for trade. Djibouti also provides labour opportunities for the pastoralists. Berbera town has a major port and mainly exports and imports commodities for Somaliand, it is the main export port for livestock

to the Middle East. There is also fishing activities that are undertaken in Berbera, fisheries are also a major contributor to the livelihoods of the population (FAO, 2004).

2.2 Seasons and Migration Patterns of the West Golis and Guban Pastoral Group

The two main seasons, the *Jilaal*, and the *Gu* influence the migration patterns of livestock in the region. In the *Jilaal* season, livestock migration occurs within the regions as there is adequate water and pasture within the area (FSNAU, 2004). During this period of normal migrations, the household migrates with all family members and livestock, Figure 2 illustrates the normal migration patterns in the larger Somalia. In times of poor rainfall performance and drought, water scarcity and lack of pasture force the population to undertake abnormal migrations where the pastoral populations migrate vast distances out of their region in search of water and pasture. Due to the vast distances covered and the harsh climatic conditions, women, children, the elderly and the physically handicapped are left behind with one or two lactating animals, while the men and younger adolescent men out-migrate (FSNAU, 2008).

2.3 Diet of Pastoralists

The diet of the pastoral populations is mainly made up of milk and cereals. The consumption of milk is vital for the growth and development of infants and children (Sadler *et al*, 2008). Breast milk, for instance, supplies all the essential nutrients for the ideal growth and development of children, consequently milk contains the nutrients required for the growth and development of their young, making it a valuable food, contributing high quality protein, fat, vitamins and minerals in the diets of young children (WHO, 2003). In addition to being a good source of fat and energy, milk is also a good source of all the eight essential amino acids

(that make up a high quality protein) in addition to zinc, potassium, sulphur and phosphorus. Milk is also equally a good source of the nutrients that are important for protection against illness. These include vitamin C (camel milk particularly), B vitamins such as riboflavin and B6, vitamin A, iodine and calcium (Sadler *et al*, 2008).

Milk from different animals (cow, camel, goat) provide comparatively the same nutrients (Table 1). Cow milk however, is the easiest to process, while camel milk has a high number of anti-bacterial properties (Barlowska et. al, 2011). Fat found in milk provides the necessary proteins, fat and also facilitates absorption of fat soluble vitamins and enhances dietary energy density (Dewey, 2005). Milk consumed regularly by a young child under the age of two years, only a small amount of additional fat (up to 5 g/d) is needed to meet requirements for essential fatty acids. However, meeting energy requirements with milk alone is difficult and requires the addition of energy based carbohydrate foods (Dewey, 2005). Nutrients that are not supplied adequately by milk include iron, niacin and folic acid. In order to meet these nutrient requirements, other animal products such as meat, poultry, fish or liver are needed. Children living in pastoral livelihood zones may have better access to some of these foods (Dewey, 2005). The pastoral diet mainly constitutes cereals namely sorghum or wheat, the main fruits and vegetables found in West Golis-Guban include tomatoes, onions, oranges, lemons, papaya and water melon.

Table 1: Nutrient Composition of Animal Milk

Nutrient	Cow milk	Goat milk	Camel Milk
Energy (Kcal)	165	173	163
Protein (g)	8.0	8.9	7.9
Thiamine (mg)	0.1	0.1	0.1
Riboflavin (mg)	0.4	0.4	0.2
Niacin (mg)	0.2	0.7	1.1
Vit B6 (mg)	0.1	0.1	0.1
Vit B12 (µg)	0.9	0.15	0.5
Folate (µg)	12.5	2.5	1.0
Vit C (mg)	3.0	3.0	9.0
Vit A (µg)	95	139	125
Calcium (mg)	288	335	317
Phosphorous (mg)	300	302	214
Magnesium (mg)	30	40	30
Potassium (mg)	380	453	354
Iodine (mg)	0.05	0.06	No data
Iron (mg)	0.2	0.1	0.5
Zinc (mg)	1.3	1.4	1.1

***Source**: Adapted from Park and Haenlin, 2006*

There are components in milk that have been shown to illustrate anti-infective properties. The regular consumption of milk by children can also lead to improved immunity and reduced incidences of disease (Hatakka et al., 2001). Cow milk, especially, in its fermented form has also demonstrated the ability to decrease the incidence and severity of diseases such as diarrhoea caused by pathogenic bacteria (Shah, 2000). Probiotic bacteria present or added in milk in the process of fermentation multiply; their growth is supported by milk's complex carbohydrates, oligosaccharides. These carbohydrates promote the growth of probiotic bacteria in the gut, and such bacteria improve intestinal microbalance, reducing the incidence of diarrhoea (Dewey, 2005). Therefore, milk in the diet of young children is important because it is a good source of high quality nutrients that are necessary for bodily functions for optimum growth and development. High quality milk consumption provides young children with the required protein, fat, riboflavin, vitamin B12, vitamin A, iodine and essential amino acids required by the body for growth. The regular consumption of milk, especially fermented milk products may help to reduce the incidences and severity of illness in children especially diarrhoea (Catley and Sadler, 2009).

2.3.1 Importance of milk in the diets of pastoralists

Milk production from cattle, camels, goats and sheep is one of the key characteristics of pastoralism. Milk and milk products largely constitute pastoralists' diet at all times. Meat, a less efficiently produced commodity is occasionally consumed or during severe food shortages. In Somalia, however, animals are also kept as a source of income through exports to other regions and countries. The main reason as to why pastoralists rely more on milk than meat has been attributed to an efficiency of the milk in energy production (Nicholson, 2000). Moreover, milk is more readily available as compared to meat which, the consumption of

meat would mean the households would have be reducing the herd size. Thus meat is sporadically consumed. Therefore, milk production and consumption allows a system which provides subsistence for more people per unit area.

While currently, pastoralist groups rarely rely solely on milk and meat for their nutritional intake, many studies have noted the significance of milk to the energy and nutrient needs, although this varies considerably by region and season (FSNAU, 2009). At household level, milk is crucial for the pastoralist children, for example, a study by Save the Children UK in Shinelle Ethiopia, a region bordering West Golis-Guban livelihood zone of Somalia, reported that milk is consumed more at a young age meaning that children are given milk more than the adults amongst pastoralists. The percentage of children over 6 months who had consumed milk during the previous day was between 68% and 94%, however the intake was related to livestock condition and migration (SCUK 2007). A high prevalence of acute malnutrition is usually noted in pastoral populations, mainly due to the changes in food habits and access to basic services, which are typically not as readily available as compared to sedentary populations.

2.4 The Effect of Seasonality on Milk Consumption Children's Nutritional Status

The correlation between seasons and milk production has been clearly illustrated by studies that have shown that milk production is a function of season rather than the stage of lactation of the animal (Sellen, 2000). During the rainy seasons, water and pasture are available; milk production tends to be higher as new grass, following the onset of the rains causes a rapid rise in milk production at almost any stage of lactation while the dry season severely depresses milk yield (Nicholson, 2000). Consequently, in the drier periods however, when water and

pasture availability has reduced, a decline in milk production is noted. During normal dry seasons, pastoralists migrate within their region in search of pasture and water. However, when the rains fail to come, pastoralists experience water and pasture shortage thus undergo abnormal migration (FSNAU, 2009). Vulnerable groups (women, elderly and children) left behind are not only left with less access to milk and livestock products because of the reduced number of animals they are left behind with, but also face the challenge of feeding and providing water for the few lactating animals left behind. The quantity and quality of milk is reduced and consequently, the consumption of milk in the household reduces. The household income from the production and sale of milk and livestock products also declines. During stressful times like this, market prices of milk in the respective area also exacerbate. This reduces the household's ability to purchase milk and other foods from the market, with increased food prices and reduced household income. Women also do not have the same level of decision making on sale of animals or animal products, a study in northern Kenya among the pastoral population indicated that, women's decisions to sell milk are usually contested, with husbands using migration decisions to resist wives' ability to market milk (McPeak et. al 2005). Therefore, access to milk and livestock products during times of drought are greatly limited (FSNAU, 2009). The fluctuations in acute malnutrition (wasting) are greater among pastoral populations, with acute malnutrition rising to about 25% GAM or higher according to a meta-analysis conducted on nutrition surveys from pastoral populations in the horn of Africa (Chotard et. al 2010).

2.5 Effect of Seasons on Morbidity and Nutritional Status of Children

Somalia bears a heavy burden of childhood illnesses. Acute respiratory infections, diarrhoea and fever are the main commonly reported childhood illnesses in Somalia. According to data

collected on child illness by FSNAU from 2001-2008, 44.8% of the 105,314 children assessed had fallen ill two weeks prior to the individual assessments conducted during this period (FSNAU, 2007). Further, the studies have shown that acute malnutrition showed significant associations with these illnesses. Children who were reportedly unwell in the two weeks prior to an assessment were 1.55 times at risk of being malnourished. Diarrhoea, which is particularly common in children of 7-24 months' age, is an important factor affecting the nutritional status of children, and can be fatal if not managed appropriately. During the dry season when water scarcity is high, communities are often forced to consume water from contaminated sources, often leading to outbreaks of acute watery diarrhoea in children, especially those aged less than five years. Inappropriate sanitation facilities and lack of access to safe drinking water often worsens the situation.

2.6 Summary of Literature Review and Gaps in Knowledge

The nutritional situation of the pastoral population in the West Golis-Guban livelihood in July 2008 was identified as worrisome (FSNAU, 2008). The area experienced consecutive seasons of rainfall failure leading to abnormal livestock out migration, water scarcity and increased household food security and nutrition vulnerability. There had not been any comprehensive and in-depth nutrition assessment documenting the nutritional status and the main causal factors of malnutrition in children in the population during drought and rainy periods. There is no information on the factors that are associated with malnutrition during the drought and wet seasons. Furthermore, there has been no study indicating if the factors associated with acute malnutrition during these seasons are the same or if they differ according to the season. Therefore, conducting a nutrition assessment in both seasons, and comparing the nutrition information and the factors affecting the nutritional status of the children is very useful in

order to document the seasonal changes of the main influencing factors affecting the nutritional status of the pastoral population.

CHAPTER THREE: METHODOLOGY

3.1 Study Area and Population

The research was conducted in the West Golis and Guban livelihood zone of Somalia. The area cuts across four administrative regions of Awdal, Galbeed, Togdheer, Sahil and parts of Sanaag regions. The study area receives an average annual rainfall of 57mm to 93mm, the livelihood zone has two main seasons, namely *Gu*, (the main rainy season), and the *Hagaa* (the driest season) in this area (FSNAU, 2004). The rainy period usually occurs in April to June, while the dry season is mainly from November to February. The wet season is characterized by a cool rainy season, while the dry season is mainly characterized by a hot dry season with high temperatures.

West Golis and Guban livelihood zone has an estimated population of 404,426 (UNDP, 2005), whose main economic activity is the sale of livestock and livestock. Islam is the only religion practiced by the population in this livelihood zone. The total under five population in the West Golis-Guban livelihood zone is 18% of the total population, and is estimated at 72,797 (UNDP, 2005). Households in West Golis Pastoral livelihood zone are categorized into: Poor (30%), Middle (50%) and Better-off (20%). The clear determinant of wealth in this livelihood zone is the ownership of livestock mainly camels, goats and sheep in order of importance and preference. Household size and number of wives vary across the wealth groups with the middle and the better-off wealth groups more likely to be polygamous, which explains the larger household sizes, poor: 6 members, middle: 8 and the better off: 11 members, (FSNAU, 2016). Majority of the West Golis pastoral households (Poor and Middle) are monogamous with a household size of about 5 -7 and 7 - 8 members, respectively while the better-off which represents a smaller portion of the population are polygamous with a household size of about

10 -12 dependents. Livestock and livestock products sales provide the largest economic sources for all wealth groups of West Golis Pastoral. The main water sources in the zone are shallow wells in the valleys, *ballis* (water catchment areas on the slopes of the mountains), springs and small seasonal streams. Pastoral households in West-Golis livelihood zone have access to two educational systems: the traditional Koranic school system and the modern educational (non-Koranic) system. Almost all pastoralists access Koranic education. Formal primary to secondary education is limited to large settlements and urban towns. Road transport is generally poor, communication networks have improved and mobile phones are widely used in the area. These services are carried out by local private enterprises such as Golis, National link and Somtel. The Poor households have a relatively strong access to the traditional social support such as Irmansi (sharing milk) and cash gifts provided by the Middle and the Better-off groups. The total number of villages constituting the West Golis-Guban livelihood zone are 88, the villages in the area will constitute the sampling frame.

3.2 Study Design

The study comprised of two cross sectional surveys conducted in two phases; phase one-during a season of drought October 2008 and phase 2 six months after in the subsequent rainfall season, July 2009, on the same population, using the same data collection methods and techniques. These studies involved detailed nutritional survey methods which for determining the household food intake and nutritional status of children 6-59 months.

The qualitative data was collected alongside the administration of the household questionnaires. A total of five FGDs were held in both seasons during the October 2008 and in July 2009 survey period. One FGD was conducted in five randomly selected clusters out

of the 25 clusters randomly selected for the cross sectional surveys. The main purpose of the qualitative data was to support information collected from the quantitative data.

Both the surveys were cross-sectional, and used cluster sampling methodology to identify the households and subsequently children to be assessed in the survey. Cluster sampling is a survey method whereby sampling units are groups and not individual units selected from a population, this forms he primary sampling unit, the households were te secondary sampling unit. In this case the clusters were the lowest administrative unit – a village, which constituted of a not less than 250 households, villages with less than 250 households were combined with the neighbouring village to constitute one cluster. The total number of villages in the study area was 88 villages, the sampling frame- list of the villages is found in the appendix. The selection of the clusters for the surveys was done using probability to size sampling to give all villages irrespective of their population size an equal chance of being selected (SMART, 2006). In each season, 25 clusters were sampled using the same procedure, using the PPS sampling methodology to randomly select clusters, in each survey, different clusters were randomly selected.

3.3 Sample Size Determination

A two stage cluster probability proportion to size (PPS) sampling methodology was used to select the total number of households to be assessed from 25 clusters in the livelihood for both the first and second phases of the study. The minimum sample size was determined using the *Fischer* method (Fisher et. al, 1992) illustrated below.

$$\mathbf{n} = \frac{Z^2 \; P\,(1-P)}{d^2}$$

Where;

n= minimum sample size

Z= statistic level of confidence (1.96)

P= Expected Probability (15)

d= Precision (3.5)

Therefore, the sample size for the nutrition survey in the first phase, October 2008 was calculated as follows:

$$N=\frac{1.96^2\ 0.15(0.85)}{3.5^2}=400$$

The total number of children to be included in the sample was 400, however households were the primary sampling unit. Therefore the total number of households assessed to achieve the total sample size of children was calculated using a non –response rate of 3%, total estimated under five population of 5% and an average household size of five. A total of 331 households were selected and all children in the household meeting the inclusion criteria were assessed. The total number of households assessed resulted in the total number of children assessed as 535 in the first survey (October 2008).

For the second phase the same method for calculation of sample size was used; however, the prevalence used for calculation was different based on the findings from the October 2008 survey. The children's sample size calculation for the second phase was as below:

$$N=\frac{1.96^2\ 0.21(0.79)}{3.5^2} = 632$$

As in the October 2008 survey, the primary sampling unit was households and in this survey, a total of 480 households was calculated, also based on a non-response rate of 3%, average household size of five and an estimated under-five population of 20%. The total number of children assessed in the July 2009 survey was 772.

3.4 Inclusion Criteria

All 11,292 households in the 88 villages that were within the West Golis/Guban livelihood zone and contained a child 6-59 months of age were eligible for inclusion in the study. There were two children in the survey in the dry season who were disabled, although the weight and MUAC measurements of these children were taken, they were not included in the anthropometric analysis, because we were not able to accurately determine their height. All children included also gave consent to be included in the survey, data was not collected from children whose caregivers did not give consent to participate in the survey.

3.5 Sampling Procedure

A purposive sampling technique was adopted in this research to identify the West Golis-Guban pastoral livelihood zone, this is one of the four pastoral livelihood zones in Somaliland (Figure 3). This was due to the identified need in the area and also physical accessibility as security in Somalia is of great concern. The study was livelihood based; therefore, all 88 villages within the West Golis-Guban pastoral livelihood zone were included in the sampling frame. The total number of villages within the West Golis- Guban livelihood zone were 88. These villages are what constituted the clusters, a village with less than 200 households was combined with the neighbouring village to constitute a cluster. The list of the villages/clusters

included in the sampling frame are included in appendix 3. The same sampling frame was used for both surveys.

For both surveys conducted in October 2008 and July 2009, ENA for SMART software was used to randomly select a total of 25 clusters per survey from the sampling frame that included all villages in the West Golis Guban livelihood zone, using the proportion to population sampling (PPS). The software also identified an additional four replacement clusters to be used in case some of the clusters were unreachable due to security reasons, however there was no reason to include the replacement clusters during the data collection, as all 25 clusters sampled remained accessible.

The team supervisors with the help of the village elders confirmed the cluster boundaries before selecting households within a village. In both surveys, households were randomly selected from the sampled clusters. This was done using random sampling, this involved coming up with a list of all households in a cluster, with the help of the village elder, then using simple random sampling method to select the households to be visited. The supervisor would use the random number table on excel to select the households. In the first survey, October 2008, from a populated list of households in a cluster, using the random table, the supervisor would select 14 households randomly, while in the second survey, the supervisor would randomly select 18 households from the list. The total number of households to be visited per cluster was determined by the total number of households in the survey divided by the total number of clusters. Therefore, the total number of households per cluster to be assessed in the first survey (October 2008) was 14 and in the second survey (July 2009) was 18 households per cluster.

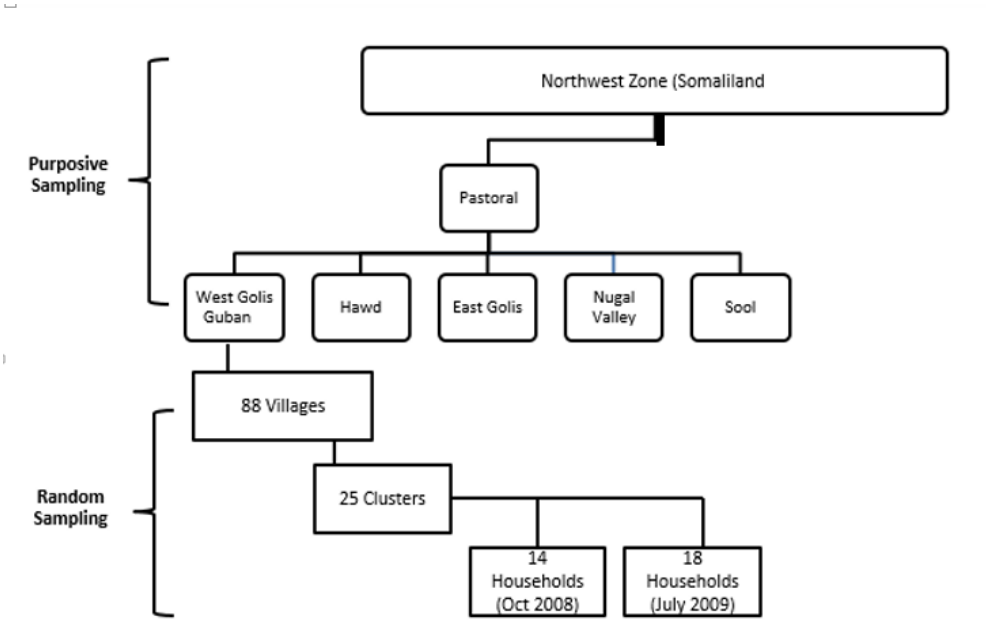

Figure 3: Sampling Chart

3.6 Data Collection Tools and Procedures

3.6.1 Data Collection Tools

To assess the objectives on determining on the general characteristics of the households, nutritional assessment, food consumption, child feeding and morbidity, a detailed questionnaire capturing all the variables was used. Anthropometric data collected included weight, height/length, MUAC, age and sex of the surveyed children. The tools used to collect these data included electronic Seca weighing scales, height boards and MUAC tapes. A calendar of events to determine the age of children was developed during the survey training with the input from the enumerators and using their local knowledge to determine significant events the population would be able to remember, to assist in accurately estimate the age of the child as birth records were not available.

3.6.2 Data Collection Procedures

The anthropometric measurements were conducted using the standard WHO guidelines and procedures (Cogil, 2003) which give the following guidance: - for weight, children were weighed with minimal clothing (light vests no diapers) and no shoes to ensure that the accurate weight measurements were recorded.

Height measurements were taken with children standing straight, no shoes, or head gear, while length measurements for children less than 24 months was taken with children lying down on the height board, with no shoes and head gear, measurements were recorded to the nearest 0.1 cm.

MUAC measurements were recorded after defining the midpoint of the arm and using a MUAC tape at this point to measure the circumference of the arm of the children 6-59 months and the mothers of reproductive age, both measurements were recorded to the nearest 0.1 cm (Cogil, 2003).

A seasonal calendar of events was generated during the enumerator training conducted ahead of the data collection, to be used by the enumerators to determine the age of children in months, as it was anticipated that most of the children had birth certificates or other documents indicating their date of birth. There was emphasis an ensuring the right age of the children was obtained.

Household food consumption was measured using the 24 hour recall household dietary diversity score, using the guidance from FAO on measuring household food consumption (FAO, 2010). Measuring of household food consumption and the various common food groups consumed was important for objectives two and three that were to determine the

common food consumed and the association of food groups consumed and nutritional status. The questionnaire recorded all the food groups consumed in the last 24 hours in the household. The food groups were classified according to the FAO list of food groups (FAO 2010) for data collection, at analysis foods were categorized to 12 food groups to generate a household dietary diversity score. The number of meals consumed per day and the cost and availability of milk at the household was also recorded.

The structured questionnaire administered to all eligible children in a household collected information on morbidity, which was one of the objectives of the study. The questionnaire asked the respondents if they were ill in the two weeks prior to the assessment, and if so recorded the reported illness.

The focus group discussions were used to seek explanatory knowledge from the community on nutrition, dietary diversity, household food consumption and health and sanitation. This gave an opportunity to probe for more information to compliment and triangulate with information collected by the structured questionnaire. Five FGDs were conducted during the first study phase, similar to the second phase of the study, making a total of 10 FGDs for both assessments.

A total of six teams were used in both phases (October 2008 and July 2009) of the study with each team consisting of two enumerators, one team leader and a supervisor, a total of 24 enumerators. Of the total team members recruited, 20 were from health facilities, while the remaining 4 were independent persons who had participated in other nutrition surveys conducted by the Ministry of Health in the region. Each team had at least one female to ensure that the caregiver/mother respondent was able to talk freely to the interviewers and also

support handling children during measurements. The team supervisors also assisted with the interpretation during the focus group discussions, which were held in the local Somali language. The role of the enumerators was to conduct the anthropometric measurements on the children, while the team leader did the interviewing and the supervisor was responsible for ensuring that the overall methodology was followed as required.

A four days training was conducted before both surveys. During the training, three days were devoted to theoretical sessions which included going through the questionnaires, sampling procedures, age estimation and measuring techniques. On the fourth day a pre testing exercise was conducted, with a follow up session to correct the issues that arose during the pretesting exercise and also testing validity of measurements. A detailed outline of the training schedule is found in the appendix.

3.7 Data Quality Assurance

Data quality was ensured thorough out the data collection process by ensuring that all the teams were well trained on the survey protocols including sampling procedures. Data collected from the field was checked every day for inconsistencies, gaps to correct any issues arising with the teams. Anthropometric data was checked using Emergency Nutrition Assessment (ENA) for SMART software which was able to run plausibility checks on the quality of the measurements, determine if there was appropriate age quality data and the proper sampling by checking the data for the age and sex ratio. During data entry, the database had checks to ensure that only data within acceptable ranges were included to avoid making mistakes. Datum was also cross checked with the questionnaires to ensure no errors.

3.7 Data Analysis

Quantitative data collected from the surveys were entered and processed using EPI-Info and ENA for SMART programs. SPSS and Epi-Info were also used to conduct analysis of the household indicators, to conduct statistical tests on the data, and also to compare the indicators from the two surveys.

The key indicators compared from the two different phases were anthropometry and household food consumption. Chi square, and logic regression tests were used to determine associations between variables and to predict the probability of certain variables affecting acute malnutrition. Logistic regression was used to determine which variables predicted acute malnutrition (categorical data), while liner regression was used to predict which variables were likely to cause acute malnutrition using weight for height z scores (continuous data).

Using the ENA for SMART software that calculates Z scores for weight for height, weight for age and height for age, outliers for assessing nutritional status were identified if the Z scores for weight for height and weight for age were above -4 or 4, for height for age -5 or 5. The outliers were excluded from the analysis. The plausibility check by ENA software was also used to determine the overall quality of the survey data by checking the data set for appropriate age distribution, the sex ratio, digit preferences for weight, height and MUAC measurements and the overall standard deviation of the data set for weight for height.

Household consumption, morbidity and general household characteristics data was checked for logical patterns. For example, only those children who fell ill in the two weeks prior to the survey were asked to answer the subsequent question on the illness they suffered from, therefore a child who did not fall ill was not supposed to have a response to the type of illness

they suffered from as they were not sick in the two weeks prior to the survey. The supervisors also checked the questionnaires during field collection for this type of logical responses to questions.

Qualitative data from the two phases (October 2008 and July 2009) were analysed independently for consistency and frequency of ideas and opinions. A total of five FGDs were conducted in each survey, during analysis, each question was reviewed, for each question, a summary of the key findings from all the FGDs was noted, the data was analysed in a similar way for all the surveys.

3.8 Ethical Considerations

The study was conducted only among respondents who freely and willingly agreed to participate in the study, and gave verbal consent. FSNAU has an agreement with the government of Somaliland to work closely with them on nutrition surveillance and activities and therefore had discussed with the government and community on this particular study and its benefits. During both surveys, clearance was given by the government and also the community leaders to conduct the survey.

CHAPTER FOUR: RESEARCH FINDINGS

4.1 General Household Characteristics of the Study Population

Table 2 shows selected socio-demographic characteristics of the households. Households assessed in the West Golis and Guban pastoral livelihood zone in the nutrition surveys" conducted in the dry season (October 2008) and wet season (July 2009) were 331 and 480 respectively. The mean household size recorded in both surveys was 5.8 (± 2.5) and 6.2 (± 2.5) in the dry and wet seasons respectively, indicating seasonality did not affect household size. Majority of the households 69.8% (October 2008) and 75.0% (July 2009); in both surveys were male headed, however the number of male headed households was slightly lower during the dry season compared to the wet season.

Table 2: Selected Socio-Demographic Characteristics of the Assessed Households

Household Characteristic	**Dry Season**			**Wet Season**		
	N= 331			**N=480**		
	N	**Percentage**	**95% CI**	**N**	**Percentage**	**95% CI**
Total Households Assessed	**331**			**480**		
Total number of children assessed	**535**			**772**		
Sex of Household Head:						
Male	231	69.8 %	58.9 - 80.6	360	75.0%	70.8 -78.8
Female	100	30.2%	19.3 - 41.0	120	25.0%	21.2-29.2

The number of children assessed in the dry season was 535, while those assessed in the wet season is 772. The mean number of children under five in the households assessed was similar in both surveys at 1.7 (±0.77) and 1.7 (±0.79) in the dry and wet season respectively.

Table 3 shows that the main source of income for the family was from sale of animals and animal products. Other sources of income for the assessed households included casual labour, petty trade, relying on remittances, and informal employment. Very few households (in the dry season 9.37% and 21.04% in the wet season) reported crop sales or farming as main sources of income for the households; as expected for pastoralists.

Table 3: Sources of Income for Assessed Households

	Dry Season N= 331		Wet Season N=480	
Income Source	**Frequency**	**Percent**	**Frequency**	**Percent**
Animal Product Sales	79	23.87	67	13.96
Crop Sales Farming	31	9.37	101	21.04
Trade	34	10.27	75	15.63
Causal Labour	96	29.00	131	27.29
Salaried/ Waged Employment	23	6.95	81	16.88
Remittances	10	3.02	20	4.17
Self-Employment	50	15.11	5	1.04
Others	8	2.42		

4.2 Access to Water, Sanitation and Health Facilities

The summary of results of access to safe water, sanitation and health facilities in table 4 illustrate that the sanitation and health facilities available among the assessed populations were below the recommended standards, according to the Sphere standards (2011), all populations should have equitable access to safe and sufficient water for drinking and domestic use, this is at least 15 litres/per day. Almost half, 41% and 58% of the households assessed in the dry (October 2008) and wet seasons (July 2009) respectively did not have access to clean safe water. A slightly higher proportion of the population had access to safe

water in the dry season compared to the wet season, as is expected due to the rains. The main source of drinking water for majority of the households was unprotected surface water. Additionally, most of the households did not treat water at the source and also their drinking water during storage.

More than half of the assessed population in both the dry and wet seasons (51.7% and 56.8% respectively) lacked access to appropriate sanitation facilities, the main reason being lack of resources at household level to construct appropriate sanitation facilities. Access to health facilities in the livelihood was also limited, with almost half of the population not being able to access health services in the area. In the dry season, 45.6%, a slightly lower proportion of the population had access to health facilities, compared 52.7% in the wet season. The proportion of those accessing the facility, showed no showed the difference was not statistically significant (chi square test value = 0.670 p=0.442; df=1). During abnormal migrations, pastoralists move further away from normal routes in search of water and pasture for their livestock, this may reduce access to health facilities. Focus group discussions highlighted distance to health facilities as one of the major factors hindering them from accessing appropriate healthcare.

Table 4: Distribution of Households by Access to Water, Sanitation and Health Facilities

WASH Indicators	Dry Season N=331		Wet Season N=480	
	Frequency	Percent	Frequency	Percent
Have access to safe water	182	**41.5**	199	**58.5**
Source of drinking Water:				
Tap/Piped	53	16.0	131	27.3
Tanker truck	70	14.6	10	3.0
Tube well	57	17.2	82	17.1
Spring	2	0.6	25	5.2
Surface water	171	35.7	208	62.8
Water treated at Source	26	7.9	87	18.1
Water treated during storage	38	11.5	90	18.8
Access to sanitation facility	143	56.8	248	51.7
Access to health facility	151	45.6	253	52.7

4.3 Nutritional Status of Study Children

The second objective of the study, was to determine the nutritional status of the children in both the dry and wet season. The number of children assessed in the surveys was 535 and 772 in the dry and wet seasons respectively. The results in table 5, show nutrition levels above emergency thresholds (WHO classification) among the population during the dry season, with a GAM prevalence of **22.3%** (CI: 17.2-28.4) and SAM prevalence of **6.6%** (CI: 4.4-9.7). During the wet season the survey results showed improved but serious nutrition levels (according to WHO classification), with a GAM rate of **13.3%** and SAM prevalence of **2.5%**, lower than the GAM and SAM prevalence reported in the drought season. The mean weight for height Z score for the surveys were -1.11 ±1.10 in October 2008 and -0.08 ±1.12 in July 2009, indicating a better nutrition situation in July 2009.

Table 5: Summary of Results for Anthropometric Indices

Characteristics	Dry Season N=535			Wet season N= 772		
	Frequency	Percent	95% Confidence Intervals	Frequency	Percent	95% Confidence Intervals
GAM (WHZ<-2 or oedema)	119	22.3	17.2-28.4	103	13.3	10.4-16.9
SAM (WHZ<-2 or oedema)	35	6.6	4.4-9.7	19	2.5	1.5-3.9
Acute malnutrition by MUAC (<12.5cm)	43	8	4.0-12.0	19	2.5	1.5-3.9
Severe Acute Malnutrition (<11.0cm)	3	0.6	0-1.2	1	0.1	0-0.8
Stunting (HAZ<-2)	91	17	13.2-20.7	55	7.1	5.5-9.2
Underweight (WAZ<-2)	158	29.5	24.2-34.9	147	19	16.4-22.0

The distribution of the weight-for-height Z scores from both surveys shifted towards the left side of the normal curve distribution, therefore depicting a poorer nutrition situation according to WHO standards, see figure 5 and 6.

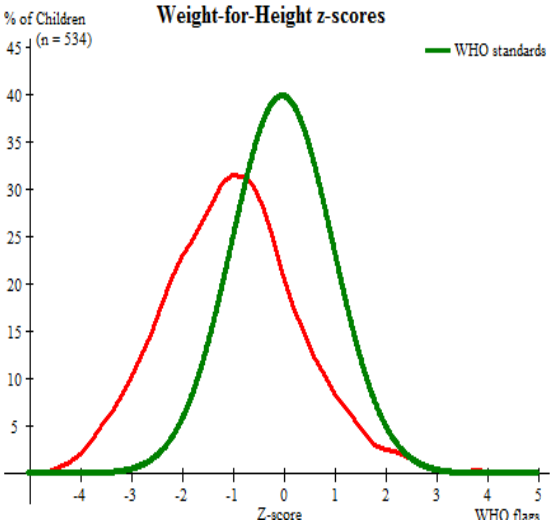

Figure 5: Graph Indicating Distribution of Weight for Height Z, October 2008

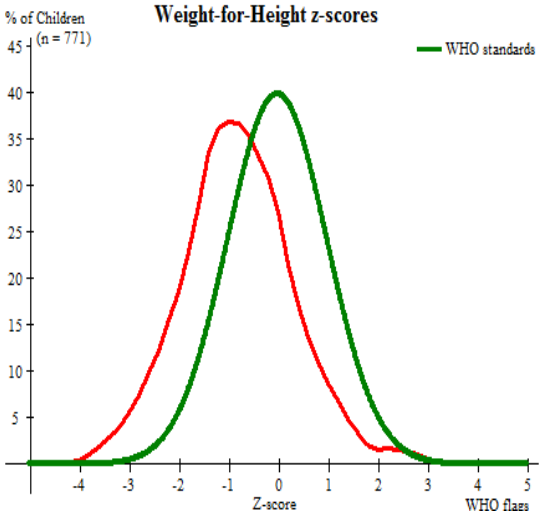

Figure 4: Graph Indicating Distribution of Weight for Height Z Scores, July 2009

Comparison of the two GAM prevalence (dry and wet seasons), indicated a statistically significant (z test value = 4.3, p=0.006, df =1) difference in the prevalence of malnutrition, with an improved nutrition situation being noted in the wet season. Other anthropometric indicators measuring acute malnutrition, the proportion of children with MUAC of <12.5 cm was also consistent with the GAM rates reported and indicated higher rates in the dry season (8.0%) than in the wet season (2.5%).

Stunting and underweight are indicators of chronic malnutrition in a population and require accurate age data to ensure their precise calculation. Strong efforts were made to determine the accurate age of children in the survey, most of the children did not have birth registration cards, and therefore a calendar designed with key events to help mothers estimate the age of the child was used to estimate the ages of the children in the survey. A higher proportion (29.5%) of children were underweight in the dry season, compared to the wet season (19%), similarly, a higher proportion (17%) of children were stunted in the dry season compared to the wet season (7.1%), this was not statistically significant (z test value = 3.37, p=0.331 df=1). Table 5 indicates the results for the anthropometric measurements for the children.

There was no difference between acute malnutrition and the sexes of the assessed children, for both weight for height < -2 Z score or presence of oedema. However, it was noted that a higher number of boys were malnourished compared to girls in both seasons. In the dry season the total proportion of acutely malnourished boys was 21.6%, while in the wet season it was 16.7% compared to 19.8% and 9.8% of the girls in the dry and wet seasons respectively. Distribution of acute malnutrition between the different age groups was similar in both assessments. In both surveys, children aged over 54 months of age were the least acutely malnourished children malnourished (7.3% and 8.0% in the dry and wet season respectively),

children aged 18-29 months recorded the highest proportion (27.5% and 25.9% in the dry and wet season respectively) of acutely malnourished children. Further analysis did not show any differences with the risk of acute malnutrition between the children in the breastfeeding age bracket of 6-24 months and those aged above 25 months in both seasons, indicating that the two age groups had equal risks to acute malnutrition. The rates of malnutrition between the dry and wet season for children in the age groups 6-17 months and 42-59 months were similar. Acute malnutrition prevalence among the age group 18-41 showed a higher number of children malnourished in the dry season compared to in the wet season, as shown in table six:-

Table 6: Acute Malnutrition by Age Group in Dry and Wet Season

		Dry Season N=535					**Wet Season** N=771			
		Severe Wasting[1]		**Moderate Wasting[2]**			**Severe Wasting**		**Moderate Wasting**	
Age (Mo.)	**Total no.**	**No.**	**%**	**No.**	**%**	**Total No.**	**No.**	**%**	**No.**	**%**
6-17	137	12	8.8	22	16.1	178	6	3.4	21	11.8
18-29	147	4	2.7	17	11.6	200	3	1.5	12	6.0
30-41	113	7	6.2	19	16.8	179	5	2.8	14	7.8
42-53	99	7	7.1	16	16.2	152	4	2.6	24	15.8
54-59	39	4	10.3	10	25.6	62	1	1.6	13	21.0
Total	**535**	**34**	6.4	84	15.7	**771**	**19**	2.5	84	10.9

[1] (<-3 z-score)
[2] (>= -3 and <-2 z-score)

4.4 Household Food Consumption and Child Feeding Practices

The third and fourth objective of the study was to determine the common foods consumed in the household and the child feeding practices. Cereals, sugar and oil were the common food groups consumed, as classified by the FAO food groups (FAO, 2010) in the study households, Figure 6 in the dry (October 2008) and wet (July 2009) seasons, according to the 24 hour diet recall.

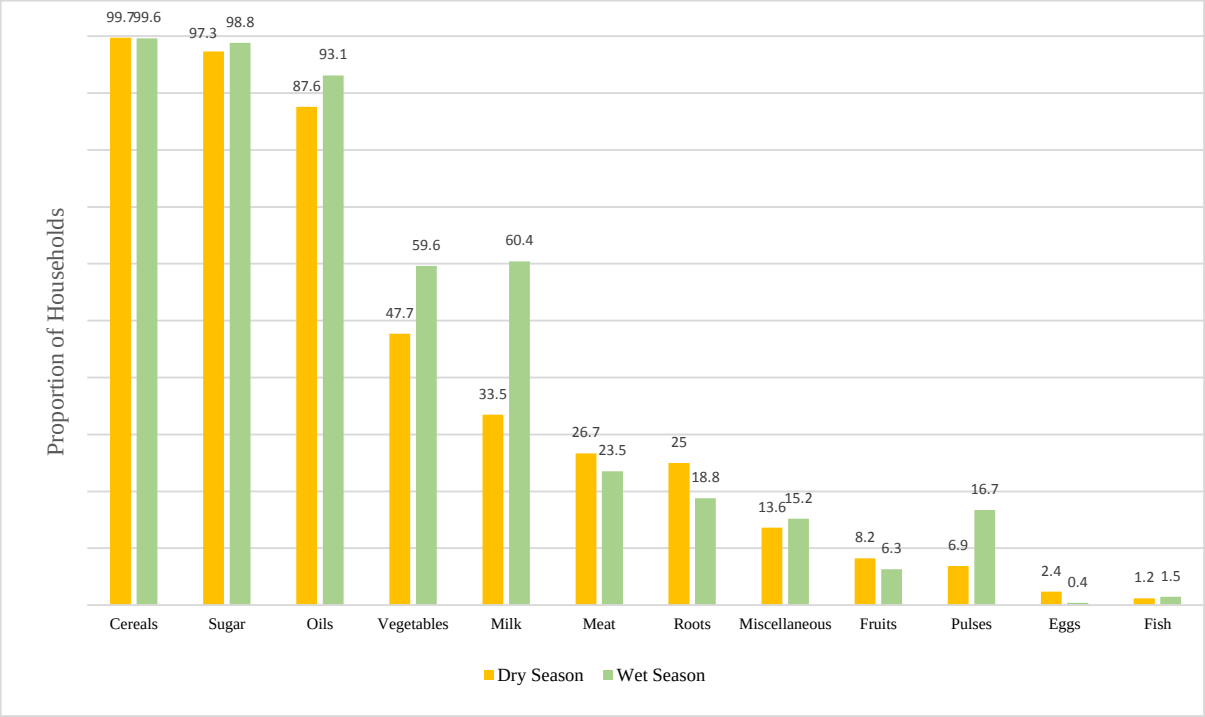

Figure 6: Distribution of Households Consumption of Various Food Groups by Season

Data showed that the study population mainly preferred wheat flour and rice, but due to increased prices and reduced availability, during the time of the assessments, maize and sorghum were the main cereals being consumed especially in the poorer households. In both seasons, the majority (>90%) consumed sugar and oil. Vegetables and milk were consumed by a higher proportion of households in the wet season compared to the dry season. A higher proportion (59.6%), of the households consumed vegetables in the wet season, compared to

47.7% in the dry season mainly because of increased availability and increased purchasing power within the households. A statistically significantly (z test value= 7.81; p=0.000 df=1) higher proportion of households (60.4%) consumed milk in the wet season, compared to 33.5% of the households assessed in the dry season. In both seasons, proportion of households that consumed the following food groups was less than 30%: meat, pulses, vegetables, fruits and eggs, with similar proportion of households consuming them in both the wet and dry season. However, a significantly higher (z test = 3.097; p=0.000 df=1) proportion of households consumed pulses during the wet season (July 2009) compared to the October 2008 dry season.

Results from the qualitative data illustrated that elevated food prices and irregular and limited supply of regular food commodities especially during the dry season resulted in reduced access and hence the reduced consumption of milk, pulses and vegetables in the household. In addition, preference was given to the purchase of cereal, sugars and oil, which are considered very crucial components of a regular diet among the population, they would rather limit spending on other foods but ensure they consistently have adequate access to cereals, oils and sugar. It was observed that a higher proportion of households (8.2%) consumed fruits in the dry season as compared to the wet season (6.3%), the difference was not statistically significant (z test value 1.425; p=0.908 df=1) nevertheless, the main fruits consumed were wild fruits that are not usually considered as part of the regular diet, and are consumed as a way of coping.

Table 7: Distribution of Households by Main Food Source by Season

Main Source of Food	Dry Season N= 380		Wet Season N=480	
	Frequency	Percent	Frequency	Percent
Purchase	257	77.6	466	97.1
Own production	18	5.4	13	2.7
Gifts	4	1.2	-	-
Food Aid	2	0.6	-	-
Bartered	3	0.9	-	-
Borrowing	10	3.0	1	0.2
Gathering	1	0.3	-	-
Social Support	36	10.9	-	-

As shown in Table 7, the main source of food in both seasons was through market purchases (77.6% and 97.1% respectively). A statistically significant (z test value = 8.99; p=0.003 df= 1) higher proportion of households obtained their food through purchase in the wet season compared to the dry season. During the dry season the households also relied on social support from relatives outside the area, borrowing, gifts and food aid as sources for food, while none of the households relied on social support during the wet season, about one out of ten households (10.9%).

During the dry season, only 47.7% of the households consumed three meals a day, the households also had a mean household dietary diversity score of 4.8 (± 1.02). However, in the wet season, a significant (z test value 6.31; p=0.001 with df=1) improvement was noted with a proportion of 67.8% of the assessed households consuming at least three meals a day and recording a household dietary diversity score of 5.2 (± 1.06).

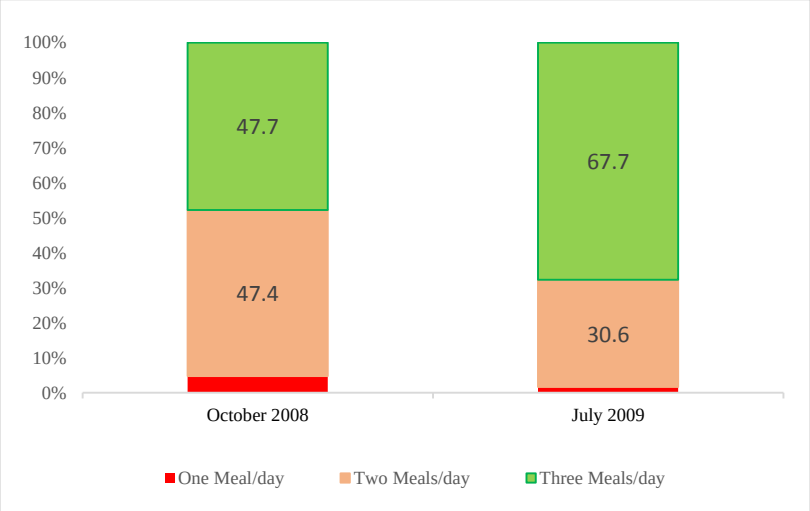

Figure 7: Proportion of Households that Consumed, One, Two and Three meals a day in the wet and dry season

The mean number of meals consumed in a day in the dry and wet season was 2.4 and 2.7 respectively, however there was no statistical difference between the mean dietary diversity score and the number of meals consumed, showing that an equal number of meals were consumed in both season. According to key informants, the availability of milk and the income from sales of milk and animal products improved in the wet season and consequently, the proportion of households consuming milk was also higher in this season.

The child feeding practices in the area in both the dry and wet season remained sub-optimal. The proportion of children aged between 6-24 months of whom were breastfeeding at the time of the assessments during the drought and wet seasons was 49.1% and 48.9% respectively, with no significant difference between the two seasons.

Figure eight shows only 3.5% and 12.7% of the children assessed in the dry and wet seasons respectively were consuming the recommended five or more meals a day (WHO 2008), with the larger proportion, 41.5% and 49.4% of the children being fed three times a day in both seasons respectively.

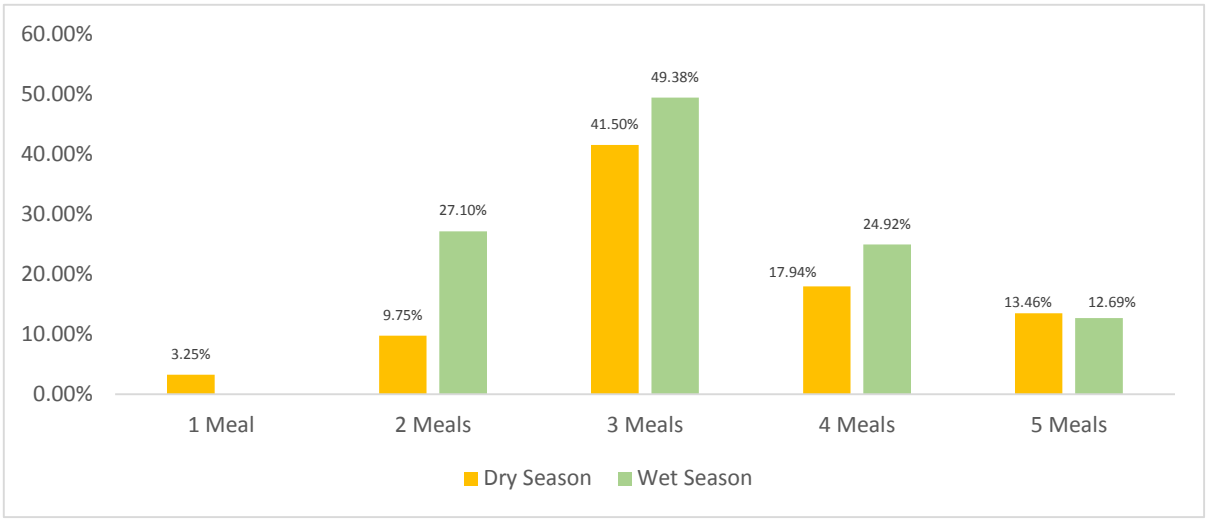

Figure 8: Percentage of children consuming 1-5 meals a day in Dry and Wet Season

Overall a higher proportion of children were fed two to five meals a day in the wet season, compared to the dry season. There was no statistically significant difference in the number of children who consumed 3 meals and above in both the dry and wet season. However there was a significant difference (z test value- p=0.004 df = 1) between the proportion of children that consumed only two meals a day in the dry season (9.75%) compared to the wet season (27.10%).

4.5 Household Food Consumption and Patterns and Acute Malnutrition

A higher proportion (86.5%) of the households consumed ≥ 4 food groups during the wet season in comparison to the dry season (76.4%). Cross tabulation of dietary diversity and acute malnutrition results for both the dry and wet seasons shown in table 9 those children from households consuming <4 food groups and were also malnourished was 19.2% in the

dry season, while those children from households consuming <4 food groups and were also malnourished in the wet season was 1.0%, likely indicating that other factors apart from dietary diversity could be affecting the nutritional status of the children in the wet season.

Table 8: Dietary Diversity and Acute Malnutrition Cases in Dry and Wet Season

		Dry Season N= 535 Children Malnourished	Wet Season N==772 Children Malnourished
DD	< 4 Food Groups Consumed (n)	**25**	1
		19.2%	1%
	>= 4 Food Groups Consumed (n)	**86**	**18**
		21.2%	2.7%
Total Number Malnourished		**111**	**19**
		20.7%	2.5%

Although a higher number of acutely malnourished children were from households who consumed <4 food groups in the dry season, Chi square tests show that dietary diversity and acute malnourishment are not statistically associated in both the dry (chi square test value 1.240; p=0.624, df=1) and wet season (chi square test value 1.032; p= 0.310, df=1). Furthermore, a logistic regression analysis was conducted to predict whether a child was malnourished or not using dietary diversity as a predictor. The test showed no statistically significance, in the dry and wet season indicating that dietary diversity could not reliably distinguish the malnourished and those not malnourished (Chi square = 1.29, p = 0.26 with df = 1).

A simple linear regression was fitted to predict and examine the relationship between household dietary diversity score and weight for height z scores of the children. The test showed no significant relationship between HDDS and acute malnutrition in the population

in the dry (chi square value= 0.677, p value = 0.411 and df=1), however there was a statistical significance for the wet season (chi square value= 8.99, p= 0.003 df=1), indicating that household dietary diversity score and weight for height z scores have a positive relationship, the higher the dietary diversity score, the better the weight for height Z score indicating a better nutritional status the higher the dietary diversity score.

Apart from cereal, sugar and oils that were consumed by a majority of the households during both the dry and wet seasons, a high proportion of the households also consumed milk. It was observed that during the dry season, few households (33.5%) consumed milk in contrast to the wet season, where 60.4% of the households consume milk. There was a significant difference in the proportions of households consuming milk between the dry season and in the wet season (chi square value 2.508; p=0.002; df= 1), with more households consuming milk during the wet season. During the dry season, children from households where milk was not consumed were 1.4% times (C.I-1.14, 1.63) more likely to be acutely malnourished than children from households that had consumed milk. In the wet season, there was no statistical difference in the acute malnutrition rates among children from households that consumed milk and those that did not consume milk.

There was also a difference in the price of milk between the two seasons. In the dry season, milk was less readily available and cost SL Sh 3,500 a litre almost double the cost compared to the wet season where the same quantity of milk in the dry season cost less (1,500 SL Sh). According to key informants and focus group discussions, milk availability declined in the dry season, there was also less milk available at household level, pushing up the milk prices, while in the wet season, milk was more readily available at the household and market level.

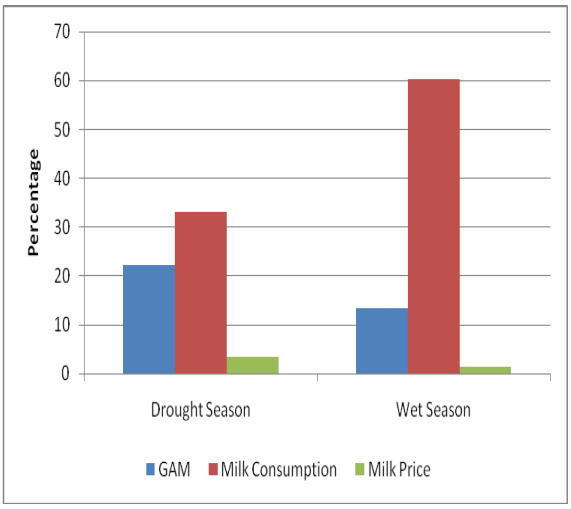

Figure 9 GAM rates, Milk Consumption and Milk Prices in the Dry and Wet Season

4.6 Child Morbidity

The fifth objective of the study was to assess the level of illness among the children 6-59 months in the West Golis-Guban livelihood zone. This was determined by collecting the number of children who suffered from any disease in the two weeks ahead of the surveys, who suffered from various diseases in both seasons. Diarrhoea was the most common form of illness among the children, with measles and malaria being the least common diseases affecting the children in both seasons.

Table 9: Proportion of Children Ill in the two weeks prior to the Surveys

Child Illness	October 2008 N=535		July 2009 N=772	
	Frequency	Percent	Frequency	Percent
Total morbidity	200	37.4	125	16.2
Diarrhoea	153	28.6	83	10.8
ARI	92	17.2	34	4.4
Measles	28	5.2	7	0.9
Malaria	12	2.2	29	3.8

The proportion of children who had suffered from one or more diseases in the two weeks ahead of the assessment was high (37.4%) in the dry season, in the wet season, the proportion of children was less by almost half (16.2%), with a statistically significant difference (chi square value = 6.523 p value=0.001, df=1), indicating that a higher proportion of children fell ill in the dry season as compared to the wet season.

4.7 Morbidity and Acute Malnutrition

The diseases reported by the respondents were diarrhoea, acute respiratory infections, malaria and measles. In the dry season, cross tabulation of the overall morbidity and acute malnutrition showed 26.5% were ill and acutely malnourished, while in the wet season, 6.5% of the children who fell ill were malnourished.

A Pearson chi-square test of independence to examine the relationship between illness and acute malnutrition in both seasons, showed that the relation between these variables was significant, in the dry season (chi square value=6.428, p value =0.011, df =1) and the wet season (chi square =9.639, p value = 0.002 df=1). Those who were ill were more likely to be malnourished than those who were not in both the wet and dry season.

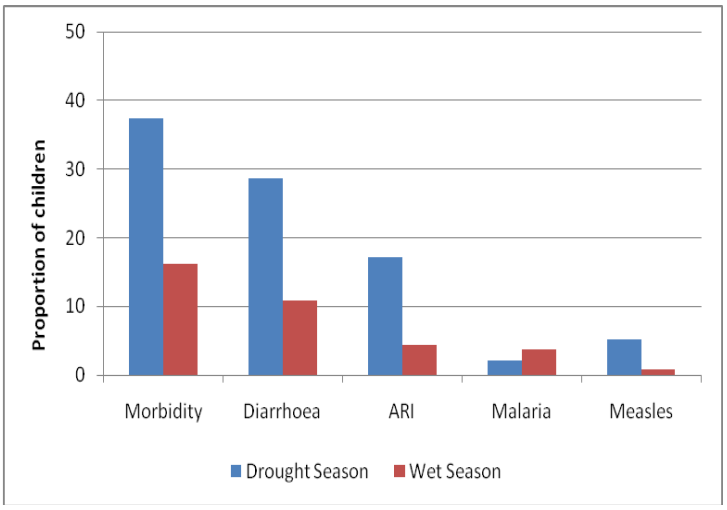

Figure 10 Proportion of Children Suffering from Various Illnesses in the Drought and Wet Seasons

In both seasons, diarrhoea and acute respiratory infections were the most common illness reported among children. A logistic regression analysis was conducted for both the dry and wet season to predict the likelihood of whether a child was malnourished or not using morbidity as a predictor. The test showed statistical significance, in both the dry season (chi square value =6.348, p value < .012 with df = 1) and the wet season (chi square value 8.349, p <.004 with df = 1). The odd's ratio results showed that in the dry season the children who were ill were 1.72 times more likely to be malnourished, while in the wet season, the child was 3.95 times more likely to be malnourished.

Cross tabulation of ARI and acute malnutrition showed that in the dry season, 32.2% of the children who had ARI were also malnourished, in the wet season there were no children who were malnourished and had suffered from ARI. Chi square tests also showed that there was a statistical association between ARI and acute malnutrition (chi square value 9.13, p=0.002,

df=1) in only the dry season. The odd's ratio also showed that children who had ARI n the dry season were also 2.7 times more likely to suffer from malnutrition.

Results from cross tabulation of diarrhoea and acute malnutrition showed in the dry season, 30.7% of the children who were malnourished also suffered from diarrhoea while in the wet season, the number was lower at 7.2%. In both the dry and wet season

, diarrhoea was statistically associated with acute malnutrition. The results of odd's ratio test (chi square value=12.609, p value 0.000, df=1) showed that in the dry season, children who suffered from diarrhoea were 2.2 times more likely to suffer from malnutrition, there was also significant association between diarrhoea and acute malnutrition in the wet season (chi square value= 7.587, p value p=0.006, df= 1). In the wet season, children who suffered from diarrhoea were 4.1 times more likely to suffer from acute malnutrition.

Further analysis on illness showed that in the dry season, there was no association between acute malnutrition and malaria, but in the wet season, there was a statistically significant association between acute malnutrition and malaria (chi square value= 7.801, p value=0.005 df=1). In addition, the odd's ration should that in the wet season, children who suffered from malaria were 5.3 times more likely to suffer from acute malnutrition.

CHAPTER FIVE: DISCUSSION

5.1 Introduction

The objectives, of the study were to assess the general characteristics of the households, in the West Golis-Guban pastoral area, assess the nutritional status and morbidity levels of the children and consumption of common foods at household level, and determine the associations between nutritional status and household food consumption and morbidity in the dry and wet season. The level of malnutrition among the children 6-59 months in the West Golis Guban pastoral livelihood zone in the dry and wet season differs, with higher levels of malnutrition noted in the dry season compared to the wet season, this is mainly influenced by overall household food consumption, and households that did not consume milk were more likely to be malnourished. However, the breastfeeding and meal frequency practices of the children aged 6-24 months in the dry and wet season were similar. In addition, the prevalence of illness among children aged 6-59 months was higher in the dry season compared to the wet season. The main diseases reported to have occurred in children two weeks prior to the surveys were diarrhoea, acute respiratory illness, measles and malaria. The diseases with the highest prevalence in both the dry and wet season was diarrhoea and ARI. There was a significant association between overall morbidity and acute malnutrition among children aged 6-59 months. In addition there was a significant association between diarrhoea and acute malnutrition in the dry and wet season. In the dry season, there was also a statistical association between ARI and acute malnutrition but not in wet season. In addition, in the wet season, there was a significant association between malaria and acute malnutrition.

The key findings of the survey confirm the first hypotheses that there is no significant relationship between household food consumption and nutritional status of children aged 6-59 months in West Golis- Guban pastoral livelihood zone, in the dry and wet season, although association was seen with milk consumption and acute malnutrition in the dry season. The second hypotheses that states there is no significant relationship between acute malnutrition and the prevalence of common diseases was negative, with overall morbidity, diarrhoea, ARI and malaria were associated with acute malnutrition in the dry and wet season.

5.2 Socio Demographic Characteristics

During the drier seasons populations will move in search of water and pasture, the whole family moves together, but during times of extreme stress, the men and older boys move with the livestock leaving the women and children behind (IFAD, 2009). This study showed the family size in the same population during the dry season was smaller compared to the wet season when less migration occurred, mainly the women and children are left behind during times of migration. Women and children are particularly vulnerable during harsh dry seasons in pastoral environments due to insecurity and conflict (Omolo, 2010), therefore when families split at times when abnormal migrations occur – this is when population migrate out of the normal migration routes and patterns due to increased stress, women and children are exposed to high vulnerabilities. The study identified that more households were female headed in the dry season compared to the wet season. Women are still not allowed to make final decisions on buying and selling of the livestock or controlling the family income and also to participate in community decisions (Kipuri et. al, 2008)

Although mobility is not in itself detrimental to health, it is a social determinant of health. The circumstance in which migration takes place, has a significant impact on health-related vulnerabilities and access to services (IOM, 2010a). During dry seasons, vulnerable pastoralist communities will invariably be affected; lack of adequate health and access to basic social facilities increases morbidity (IOM, 2009). The pastoralists in the West Golis/ Guban livelihood of Somalia also face the same predicaments as other pastoralists. During dry seasons, access to safe water and health facilities reduces, and there is increased risk of disease. Access to health care and social services also decreases during drought, increasing the chance of increased diseases incidences (Fratkin 2004). The study showed that surface water was the main source of drinking water for the households during the wet season, in the dry season, in addition to surface water, water was bought from water tankers. In both seasons, treatment of drinking water was low, however much lower in the dry season. Water borne diseases commonly affect the population in the dry season, in pastoral populations, dangers of water contamination and water-borne human illness increase at this time (Shivoga et. al, May 2003).

During droughts, the sale of livestock and animal products may increase, especially for households that keep livestock for subsistence (Mwanyumba et. al, 2015), however the prices are not usually favourable due to poor animal body conditions. This study showed in the dry season, the main source of income was from sale of animals and animal products, during the wet season it was from casual labour. During the wet season, in the Northwest Zone of Somaliland, there are increased causal labour opportunities, as these opportunities coincide with the peak of agricultural opportunities, increasing the purchasing power of households (FSNAU, 2011).

5.3 Nutritional Status

The study showed a significant difference in acute malnutrition in the dry (GAM 22.3%) and wet season (GAM 13.3%), the national prevalence of acute malnutrition for Somalia is 15%, while the national prevalence for stunting for Somalia is 26% (Global Nutrition Report, 2015). The acute malnutrition prevalence measured by mid upper arm circumference in both seasons, was consistent with the weight for height scores that showed higher acute malnutrition rates in the dry season compared to the wet season. The prevalence of acute malnutrition by MUAC <12.5 cm in the dry season was 8.0%, while in the wet season it was 2.5%, although this shows lower rates compared to the weight for height indicators, MUAC and weight for height are not alternative measures of acute malnutrition, but complementary variables that measure acute malnutrition independently (Golden et. al, 2015). This further validates the results between of the surveys conducted in the dry and wet season, underlining there is increased acute malnutrition in the dry season compared to the wet season, highlighting that there are opportunities to put in place interventions that mitigate increasing malnutrition in the dry season.

According to a meta-analysis of data from over fifty nutrition surveys conducted in Somalia, stunting is not a serious public health issue in Somalia. Stunting was seen in only 10.8 percent of 6-59 month old children surveyed (FSNAU 2013). In this study, higher stunting rates were noted in the dry season (17%) compared to the wet season (7%). However the mentioned meta-analysis showed no significant association between acute malnutrition and stunting. Nevertheless, prevalence of stunting in children (6-59 months) showed a significant correlation with prevalence of underweight. The study shows the proportion of children

underweight in the dry season (29.5%) was higher compared to the wet season (19%), both rates were below the national average of 35.6% (Global Nutrition Report, 2015).

5.4 Household Food Consumption

5.4.1 Household dietary diversity

The mean number of food groups consumed in the dry season (4.8) was lower than the wet season (5.2), dietary diversity can be an indication of household food security (Ruel, 2002). The main food groups consumed among the Somali population are cereals, oils and sugar, these provide the highest caloric provision in the diet (FSAU, 2004). The study showed that cereals, oils and sugar were the main foods consumed. In both seasons, there was no difference in the number of households that consumed these food groups, however, the study shows a higher consumption of milk, vegetables and legumes in the wet season compared to the dry season. During times of drought, milk consumption declines due to poor livestock body conditions and productivity, and less consumption of nutritious rich foods such as vegetables and pulses due to availability and required cooking fuel (FAO, 2005). Although there were differences in consumption of vegetables and pulses in the wet and dry season, the proportion of households that consumed vegetables, pulses and fruits was low. Consumption of vegetables is an important way to optimize nutrition to reduce disease risk and maximize good health (Van Duyn, 2000). In the study, the consumption of fruits increased during the dry season, because during the dry season, there is a higher consumption of wild fruits, mainly *canab* as a coping strategy (FSAU, 2002). Fruits, vegetables, fish and eggs are good source of micronutrients that are crucial for healthy development and growth, and their consumption especially during a period of reduced dietary intake is beneficial (Kearny 2010).

In this study, during the wet season, more households were consuming a diverse diet compared to the drought season. In the wet season the households have more access to animal products and increased casual labour opportunities increasing purchasing power to purchase a more diversified diet (FSNAU 2011). According to key informants in the study, during the drought season, most households have reduced income. In the study, in the wet season, the main source of food was through purchase, while in the dry season it was mainly purchase and social support. Decreased dietary quality and quantity are the most immediate effect of reduced household income and high food prices (Meerman et. al, 2012). Consumption of a more diversified diet reduces the chances of being acutely malnourished, a higher household dietary diversity score is associated with a significantly lower likelihood of wasting (Dickson et. al 2010). Studies have shown that a higher dietary diversity is associated with nutritional status of children (Arimond et. al 2004), this study shows a better nutritional status in children during the wet season when the households consumed a more diversified diet.

5.4.2 Meal frequency

A low proportion of households consumed only one meal in the study, with a slightly higher number consuming only a meal a day in the dry season compared to the wet season. Pastoralists tend to consume between 2-3 meals a day even in normal times (FSAU, 2002). In the dry season, a lower proportion of children consumed 2-3 meals a day compared to the wet season. In the dry season the number who consumed only two meals a day was almost half the number of those who consumed the same number of meals in the wet season, possibly indicating that those with poorer meal frequency in normal times, only get worse in times of stress (drought). Children should consume an average of 6 meals per day, for optimum health

(WHO, 2014) Poor infant feeding practices namely low meal frequency and low dietary diversity have an impact on acute and chronic malnutrition status of children, especially coupled with increased morbidity and poor access to health care (Robert et al, 2013). Breastfeeding practices were sub-optimal but similar in the dry and wet season, however breastfeeding practices in Somalia are more controlled by cultural practices than seasonal changes (FSNAU, 2007)

5.4.3 Milk consumption

Milk remains the main source of quality nutrients among the pastoral population, it is a good source of high quality protein and micronutrients and is also an important contributor to the overall total energy intake of the pastoral population (Sadler et al 2009). This study shows higher consumption of milk in households during the wet season compared to the dry season. Many pastoral ethnic groups in Eastern Africa derive their dietary energy (50-90%) from milk and milk products (Bekele, Catley and Draft, 2008). In the wet season, there is more pasture and water available for livestock and no abnormal out migration of livestock and the resultant negative impacts compared to the dry season. In addition to milk consumption, the households also benefit from the sale of milk and animal products, this way they have a source of income to purchase other types of food and take care of basic essential needs (FSNAU 2009). During a normal lean season, pastoralists have to migrate within their region in search of pasture and water for their livestock, however during times of drought, the coping mechanisms adapted are different. Pastoralists out-migrate from their region moving vast distances in search of water and pasture for their livestock while, the vulnerable groups; women, the elderly and children are left behind, with few lactating animals, greatly affecting the consumption of milk of these vulnerable groups (Kipuri et. al, 2008).

This study shows the cost of milk in the local markets also increases during drought thus reducing the household's ability to purchase adequate milk, hence lower consumption during the drought compared to the wet season. The cost of milk is influenced by availability and increases during lean seasons (FSNAU, May 2013). Observational studies from developing countries show positive associations between milk consumption and linear growth in preschool children, milk consumption was significantly associated with higher height-for-age Z scores and diets of taller children contained more animal products, including milk, than did diets of shorter children (FAO, 2013). The study indicates that children from households where milk was not consumed were one and a half times more likely to be malnourished, further outlining the importance of milk in the pastoral diet. Acute malnutrition rates are significantly different during the wet season when more milk is available, costs less and is consumed more frequently as compared to the drought season.

The study illustrates a lower proportion of acutely malnourished children (GAM 13.3% and SAM 2.5%) in the wet season compared to the malnutrition rates in the dry season (GAM 22.3% and SAM 6.6%), with a significantly higher proportion of households consuming milk in the wet season compared to the dry season. Reduced milk consumption at household level may have an impact on acute malnutrition (FEWS-NET, 2006). In addition, more children were underweight and stunted in the dry season, compared to the wet season this could also be likely to the differences on the sampling in both surveys, the consumption of animal source foods is associated with reduced risk of stunting and underweight (Darapheak, 2013).

5.5 Child Morbidity

Infections increase the nutrients of an individual, leading to high energy expenditure, lower appetite, nutrient losses due to vomiting, diarrhoea, poor digestion, mal-absorption and the

disruption of the utilization of nutrients. (Morris et. al, 2008). The study shows almost twice (28.6%) of the children assessed were sick in the dry season compared to the wet season (16.2%). During drought seasons, scarcity of food and poor diet can lead to under nutrition in children making them more susceptible to diseases resulting in higher morbidities (Singh et. al 2006). In the study, during the dry season, the households consumed a less diversified diet, consuming less vegetables, milk and pulses and children consumed fewer meals a day compared to the wet season.

A study by Asfaw et al, in 2015 in South Ethiopia, showed that the presence of diarrheal morbidity a the contributing factor for underweight and stunting. Similarly in this survey, in the dry season, the prevalence of diarrhoea prevalence was higher compared to the wet season, and so was the stunting and underweight rates. Water scarcity during the dry season forces households to turn to extremely unsafe water sources in the area which ae contaminated (FSNAU, 2009). In this study the proportion of households that consumed untreated water was higher in the dry season compared to the wet season, and a higher proportion of children suffered from diarrhoea in the dry season compared to the wet season. Respiratory infections normally peak at during the dry seasons, (FSNAU 2010), it was noted in the study that a much higher proportion of the children suffered from acute respiratory infections in the dry season, than in the wet season. Overall morbidity is a key factor in influencing the nutritional status of children. Poor access to appropriate sanitation, safe water and health services for the

population was also observed in both seasons, thus making health seeking a great challenge, not only for the assessed livelihood but in the country as a whole[3] (FSNAU, 2007).

CHAPTER SIX: CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

In conclusion, the nutritional status of children differs by season and is worse in the dry season. The factors that influence the nutritional status of the children in both seasons is, dietary diversity and morbidity. Nutritional status is better in the wet season, and there is also improved dietary diversity in the wet season which includes consumption of vegetables, fruits and pulses. Meal frequency for children 6-23 months differs slightly in both seasons, children are fed more meals in the wet season.

In both seasons, morbidity is high and affects the nutritional status of children. Diarrhoea, and acute respiratory illnesses affect nutritional status in both seasons. Malaria affects the nutritional status of children mainly in the wet season.

Breastfeeding practices remain the same in both seasons. In both seasons access to safe water and sanitation remain unchanged.

6.2 Recommendations

It is crucial to address the nutritional needs of this highly vulnerable population, and have interventions that are responsive to the changes in seasons. To ensure access to various foods in the dry season, interventions that target increased livestock production and income for households should be encouraged, such as providing pasture/fodder for livestock during dry spells. In addition, rehabilitation of acutely malnourished children and delivery of basic health services and treatment of children suffering from diarrhoea, ARI and malaria should be

enhanced and delivered in a way that is sensitive and responsive to the seasonal variations. It is also important to ensure access to safe, clean sufficient water especially during times of scarcity like in the dry season. Health education is also imperative to assist the community in preventing diseases and making informed decisions on health matters mainly, hygiene and sanitation and seeking appropriate health care.

Interventions targeting and supporting the livestock industry are also important as the main source of livelihood in the area and should be encouraged. This include fodder conservation practices, access to water for livestock.

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APPENDICES

Appendix 1: Nutrition Assessment Household Questionnaire, 2008

Household Number _____ Date_____Team Number _____Cluster Number _____Cluster Name _____District: _____

Q1-8 Characteristics of Household

Q1. Household size[4] ?_____

Q2. Number of children less than 5 years (0-59 months)? _____

Q3. Sex of household head[5]? 1=Male 2=Female

Q4a . How long has this household lived in this locality? 1= Resident 2= IDP<3 Months 3=IDP March '07 4= IDP Pre 2007

b. Are you hosting any recently (in the last 6 months) internally displaced persons? 1= Yes 2= No

c. If yes, Number of persons _____

d. If yes, what is the impact of IDPs on the household? 1=Receive food aid 2=Increased income for the household 3=Less resources available 4=

Q5. Does household have mosquito net? _____ 1= Yes 2= No Q6. If yes, ask to see the net: _____ 1= GFSOM label 2=Other type 3= Not seen

Q7. What is the household's main source of income? 1= Animal & animal product sales 2= Crop sales/farming 3= Trade 4=Casual labour 5= Salaried/wage employment 6= Remittances/gifts/zakat 7=Self-Employment (Bush products/handicraft)

[4] *Number of persons who live together and eat from the same pot at the time of assessment*
[5] *One who controls and makes key decisions on household resources (livestock, assets, income, and food), health and social matters for and on behalf of the household members.*

8= Others, specify _____

Q8-15 Feeding and immunization status of children aged 6 – 59 months in the household.

First Name	**Age** (months) *(**if** child is more than 24 months old, **skip** to **Q13**)*	**Q8** Are you breastfeeding[6] the child? *(**if** no, skip to **Q10**)* *1=Yes* *2= No*	**Q9** **(If 6-24 months)** If you stopped breastfeeding before the child was 12 months, why did you stop? *1= Pregnancy* *2=Illness* *3=Child refused* *4= Other* *5= Never breastfed*	**Q10** **(If 6-12 months** At what age was child given water/ foods other than breast milk? *1= <1 weeks* *2=1wk – 3 months* *3=4-6 months* *4=6 months or more.*	**Q11** How many times do you feed the child in a day *(besides breast milk)*? *1= 1 time* *2=2 times* *3 = 3 times* *4=-4 times* *5= 5 or more times*	**Q 12** Has child been provided with Vitamin A in the last 6 months? *(show sample)* *1=Yes* *2= No*	**Q13** Has child been Vaccinated against measles? *1=Yes* *2= No*	**Q14** Has the child ever been given polio vaccine orally? *1=Yes* *2= No*
1								
2								

[6]*Child having received breast milk either directly from the mothers or wet nurse breast within the last 12 hours*

3								
4								

Q16-27 Anthropometry and morbidity for children aged 6 – 59 months in the household

First Name	Q15a Age	Q15b Sex *1=Male* *2=Female*	Q16 Oedema *1=yes* *2= No*	Q17 Height (cm) *To the nearest tenth of a cm*	Q18 Weight (kg) *To the nearest tenth of a kg*	Q19 MUAC (cm) *To the nearest tenth of a cm* *(>6 mo)*	Q20 Diarrhea in last two weeks *1= Yes* *2= No*	Q21 Serious ARI (*oof wareen/wareento)*[7] in the last two weeks *1=Yes* *2= No*	Q22 Febrile illness/ suspected Malaria[8] in the last two weeks *1=Yes* *2= No*	Q23 Suspected Measles[9] in last one month *1=Yes* *2= No*	Q24 Did the child sleep under a mosquito net last night? *1=Yes* *2= No*	Q25 Where did you seek healthcare assistance when child was sick? **(**If yes in ***Q20-23)*** *1=No assistance sought* *2=Own medication* *3=Traditional healer* *4=Sheikh/Prayers* *5=Private clinic/ Pharmacy* *6= Public health facility*	Q26 Is the child currently registered in any feeding centres? *1= SFP* *2= TFC* *3= OTP/CTC* *4= Other* *5=None*

[7] *ARI asked as oof wareen or wareento. The three signs asked for are cough, rapid breathing and fever*
[8] *Suspected malaria/acute febrile* illness: - the three signs to be looked for are periodic chills/shivering, fever, sweating and sometimes a coma

[9] *Measles (Jadeeco): a child with more than three of these signs– fever and, skin rash, runny nose or red eyes, and/or mouth infection, or chest infection*

1													
2													
3													
4													

27: Anthropometry (MUAC) for adult women of childbearing age (15-49 years) present at the household

Sno	**Name**	**Age** (years)	**Received Tetanus vaccine?** *1= Yes* *2= No*	**MUAC** (cm)	**Physiological status** *1=Pregnant* *2= Non pregnant*	**Illness in last 14 days?** If yes, what illness?
1	*Mother:*					

Codes** for adult **illnesses	
0= None	1= ARI
2=Diarrhoreal	3=Malaria/Febrile
4=Joint	5=Urinal
6=Organ	7=Anaemia
8= Reproductive	9=Other, specify

Q 28 Food Consumption & Dietary Diversity

Twenty four-hour recall for food consumption in the households: The interviewers should establish whether the previous day and night was usual or normal for the households. If unusual- feasts, funerals or most members absent, then another day should be selected.

Food group consumed: What foods groups did members of the household consume in the past 24 hours (from this time yesterday to now)? Include any snacks consumed.	Did a member of your household consume food from any these food groups in the last 24 hours**?** *1=Yes* *0= No*	**Codes:* 1= Own production 6=Borrowed 2=Purchases 7=Gathering/wild 3=Gifts from friends/ relatives 8=Others, specify___ 4=Food aid 9=N/A 5=Bartered
Type of food		**What is the main source of the dominant food item consumed? *(Use codes above)?***
1. Cereals and cereal products *(e.g. maize, spaghetti, rice, caanjera[10], bread*)?		
2. Milk and milk products *(e.g. goat/camel/ fermented milk, milk powder)?*		
3. Sugar and honey?		
4. Oils/fats *(e.g. cooking fat or oil, butter, ghee, margarine)?*		
5. Meat, poultry, offal *(e.g. goat/camel meat, beef; chicken or their products)?*		
6. Pulses/legumes, nuts *(e.g. beans, lentils, green grams, cowpeas; peanut)*?		
7. Roots and tubers *(e.g. potatoes, arrowroot)?*		

[10] A type of Somali bread

8. Vegetables *(e.g. green or leafy vegetables, tomatoes, carrots, onions)?*		
9. Fruits *(e.g. water melons, mangoes, grapes, bananas, lemon)*?		
10. Eggs?		
11. Fish and sea foods *(e.g. fried/boiled/roasted fish, lobsters)?*		
12. Miscellaneous *(e.g. spices, chocolates, sweets, beverages, etc)?*		
Q29 In general what is the <u>main</u> source of staple food in the household? ***(*Use codes in 29 above)*** **_____**		
Q30 Total number of food groups consumed in the household: _____		

Q31 How many meals[11] has the household had in the last 24 hours (from this time yesterday to now)? 1= One 2=Two 3= Three Access to water (quality and quantity)

Q32a What is the household's main source of drinking water? 1 = Tap/ piped water 2= Tanker truck 3= Tube well/ borehole 4= Spring 5= Bottled water

6= rooftop rainwater 7= Surface water (river, stream, dam, pond, open well; water catchments; berkad, etc)

Q32b What is the household's main source of water for other domestic uses? _____ *(Use codes in Q33a above)*

Q33a Is drinking water drawn from a protected/safe source? 1= Yes 2= No

Q33b If household has no access to safe protected water what is the main reason? 1= Not Available 2= Distance too far 3= Security Concerns 4= Cannot afford

Q33a Do you get a reliable supply of drinking water from this source? 1= Reliable supply 2=Seasonal supply 3= Occasional problems 4= Frequent problems

[11] *A meal refers to food served and eaten at one time (excluding snacks) and includes one of the three commonly known: - breakfast, lunch and supper/dinner*

Q33b Is water treated at the: a) source? 1= Yes 2= No b) storage level? 1= Yes 2= No

Q33c If treated, what is the method of treatment? 1= Boiling 2= Chlorination 3= straining/filtering 4= Decanting/ letting it stand and settle 5= Other, specify

Q34 Average time taken to and from the nearest water point *(including waiting and collecting time)* 1= <30 min 2=30 – 60 min 3= 1-2 hrs 4= more than 2 hrs

Q35 Number of water collecting and storage containers of 10-20 litres in the household: 1=1-2 containers 2= 3-4 containers 3=4-5 containers 4= more than 5

Q36 How is water stored in the household? 1= Clean containers with cover 2= Closed plastic containers 3= open buckets/ pans 4= *Ashuun (*with *c*onstricted neck/end)

Access to Health Facility

Q37a Do you have access to a health facility?

1 = Yes 2 = No

Q37b If yes, do you use it? 1 = Yes 2 = No

Q37c If not, why not? 1 = Too expensive 2 = Too far 3 = Not enough time 4 = Security restrictions 5= Others

Sanitation and Hygiene (access and quality)

Q38a Type of toilet used by most members of the household 1= Bush/open ground 2= Traditional pit latrine/ Open pit 3= Ventilated Improved pit latrine (VIP) 4= Flush toilets

Q38b If household has no access to sanitation facility, what is the main reason? 1= Pastoral/ frequent movements 2= Lack resources to construct 3= Doesn't see the need

Q39 Distance between latrine and water source (if underground or surface source) 1=1- 30 metres 2=30 metres or more

Q40 How many households share/use the same facility? 1= One 2= 2- 9 3= 10 or more

Q41 What key times do you maintain hygienic hand washing practices 1= before eating 2= before preparing food 3= before feeding the baby 4= after cleaning the baby's bottom 5= after defecation 6 = None /Not applicable

Q42 What substance do you use in your household for washing utensils, hands; body and clothes? 1= Soap/Shampoo 2= Sand 3= Ash 4= Plant extracts 5= None

Checked by supervisor

(signed): _____

Appendix 2: Focus Group Discussion Guide- Guban Nutrition Assessment October 2008

A: Feeding and care practices

1. a) For how long do mothers breastfeed their babies among this community?

   b) What are the common foods normally given to children below 2 years in this community? How many times per day? (Specify ingredients)

Common foods	Age when introduced	Ingredients	Number of times given
Water			
Sugar solution			
Cows/camel/goat milk			
Semi solid foods(porridge and others)			
Solid foods (caanjera, rice, spaghetti),			

2. At the moment, what meals are given to children 0-2 years and how many times per day? (Specify ingredients)

Common foods	Ingredients	Number of times given
Water		
Cows/camel/goat milk		
Semi solid foods(porridge and others)		
Solid foods (caanjera, rice, spaghetti),		

B: Food Security

3. Has there been any change in food consumption (diets) in the last three months? Specify and give reasons for change if any.

……
……
……
……

4. What constraints do households (women) normally face in providing adequate food for their families?

In terms of:

Effective breast feeding and child feeding	
Food preparation	
Food processing, preservation & storage	
Food service and sharing/rations	

5. What would you say is the level of current availability and accessibility of the following foods?

Foods	*Codes:* 1= Absent/none 2= Low 3=medium 4= High	
	Availability	*Accessibility*
Meat		
Goat milk		
Cow milk		
Camel milk		
Spaghetti		
Beans/ peas		
Wheat		
Rice		
Maize		
Sorghum		
Sugar		
Cooking oil		
Potatoes		

6. In the past 30 days, if there have been times when people did not have enough food or money to buy food, which of the following coping strategies did they use?

Coping strategy	*1= Yes 2= No*
a. Reduce home milk consumption and sell more of milk produced	
b. Shift to less preferred/less expensive cereal foods	

c. Borrow food on credit from another household *(Aamah)*	
d. Reduce the number of meals per day	
e. Limit the portion/quantity consumed in a meal *(Beelehamis)*	
f. Rely on food donations (gifts) from the clan/community *(Kaalmo)*	
g. Consume weak/ un-saleable animals *(caateysi)*	
h. Send household members to eat elsewhere or to live with relatives	
i. Skip entire day without eating *(Qadoodi)*?	
j. Beg for food *(Tuugsi/dawarsi)*	
k. Rely on hunting (or wild foods) for food *(ugaarsi)*	

7. a) Have there been any population or animal movements in the past 3 months? If yes from where to where?

……
……
……

b) Have there been any reported animal deaths in the village? If yes what was the extent of this problem?
……
……
……

C: Water Sanitation and Hygiene

8. Water and Sanitation

a) What is the main source of water for the people?	
b) Is drinking water treated at point of supplies and/or at point of use?	
c) What is the average distance to the water point?	
d) On average how much water is used by each person/day?	
e) How many people on average share a water point/source?	
f) How far away is the toilet from the water source for the majority?	
g) How many people on average share a toilet facility?	
h) How are children faeces disposed of?	

D: TOT

9. Prices of major foods (flour, rice, milk, sugar, etc) and other essential commodities (water, cooking fuel, etc) for the village

Item/material	Price/unit in SSH (Exchange rate- 1US$ = _____SSH)	
	In June 2006	Now (September 2006

10. What are the **main** sources of income for most households in order of priority?

_____

_____

_____

E: Morbidity

11. What are the common illnesses in this village among children and adults?

	Illnesses	Possible causes/reasons
Children	_____ _____ _____ _____	_____ _____ _____ _____
Adults	_____ _____ _____ _____	_____ _____ _____ _____

Appendix 3: Nutrition Assessment Training Timetable

DAY 1		
TIME	**SESSIONS**	**RESPONSIBLE**
8.30 AM – 9.00 AM	INTRODUCTIONS/REGISTRATION	MOH
9.00 AM – 9.15 AM	GROUND RULES	MOH
9.15 AM – 10.00 AM	SURVEY OBJECTIVES	Louise
10.00 AM – 10.30 AM	BREAK	
10.30 AM – 12.30	HH QUESTIONNAIRES	Louise
12.30 – 2.30 PM	PRAYERS	
2.30 PM – 4.00	HH QUSTIONNARES	Louise
DAY 2		
7.30 – 8.15 AM	HH QUESTIONNAIRES REVIEW	Fuad
8.15 – 8.45 AM	MORTALITY QUESTIONNAIRES	Louise
8.45 – 9. 30 AM	MORTALITY QUESTIONNAIRES	Louise
9.30 – 10.00 AM	MORTALITY SCENARIOS	Louise
10.00 – 10.30 AM	BREAK	
10.30 – 10.15 AM	MORTALITY SCENARIOS	Fuad
11.15 – 12.30 PM	TAKING MEASUREMENTS	
12.30 PM-230PM	PRAYERS & LUNCH	
2.30 PM – 3.00PM	METHODOLOGY/SAMPLING	Louise
3.00PM – 4.00PM	PRACTICE/ ROLE PLAY – INTERVIEW TECHNIQUES	Fuad/Nura

DAY 3		
8.00 – 10.00 AM	AGE DETERMINATION	Louise
10.00 – 10.30 AM	BREAK	
10.30 – 10.45	QUALITY CONTROL	Louise
10.45 – 12.00	CLUSTER SELECTION	Louise
12.00 – 12.30 PM	TEAMS FORMATION 1	Fuad/Nura
12.30 - 2.30 PM	LUNCH BREAK	
2:30 – 4.00PM	ROLE PLAY- TAKING MEASUREMENTS	Fuad/Nura
DAY 4		
7.30 – 10.00 AM	PRE-TESTING	ALL
10.00 – 10.30 AM	BREAK	
10.30 – 11.30 PM	FEEDBACK	ALL
11.30 – 12.00 AM	TEAMS FORMATION 2	ALL
12.00 – 12.30 PM	SUPERVISION	SUPERVISORS/ TEAM LEADERS

Appendix 4: Sampling Frame List of Villages

Villages in the West Golis/Guban Livelihood Zone	Population
Heego	500
Xamarta Durdureed	900
Xoorey	900
Aroweine	700
Ruqi	800
Baysaarey	800
Xamarta Hogeed	800
Simodi	500
Ali Xaydh	800
Edagan	800
Seemaal	800
Boodhka	700
Weeraar	700
Fadhi xun/Hungery	800
Arawarein	800
Lawyacado/Bariislay	1500
Ashacado/Aday waadari	800
Ceelgaal/godin Abreeyn/Maandaho	1000
Jidhi/Gargaaro Galbeed/Sh.Cise/Camun culus	1000
Cabdulqadir/Madax dadlay/Cagagub	2000
Sheekh Cadawe/Nuur odowaa	1000
Habaas/Geelkagooji	1000
Xuseen/Damasha	800
Heemaal/Wadajir	800
Daba dilaac/Buurcad/Ilcarmo	1000
Sheekh Aware/golcaday/bagay/Hooroone	900
Fiqi-Aden/gobley/Libaxley	900
Arooseel/Dharey	1000
Tokhoshi	1000
Riirga Kalowle	700
Hadayta	700
Ceel lahelay	1000
Hulka	1000
Gargara	800
Balayga/Tuurka	1000
BeyoAdeed	800
Garobadar	1000
Waraqadhigta	700
Sheeddheer	600

Geb	600
Farda lagu xidh	1500
Geerisa	2000
Riirga Karuure	800
Osoli	900
Beyo Garaaca	900
Ceelsheekh	1000
Sh.Xuseen	800
Bildhaaley	500
Idocadays	800
Laan Cabaale	800
Damasha/eeb	1000
Beeyo Kulul	1000
Balanbalay	1000
Sabawanaag	900
Bodaale/Higle Kabede	300
Ceelsheikh	500
gobdhere/Sabowanag	350
Maqhida inata/Dabaraqas	400
Faruur	500
Waltyeen	300
Baqayalay	450
Salay	500
Buro Kibir	350
Bahdon	300
Lasxig	300
Hayeki/Bohol	600
Xagal	500
Dhuhun	500
Lascidle	1000
C/baxay	500
Hiddilay	500
Beeyo Macan/Raribul	850
Abdal	2500
Biyoley	500
T/dhibijo	500
Cl/darad/Karin	400
habalo tumod/Gambaho	400
Darigodle	1000
Hamas	500
Lafarug	1000
Beyo Macan	400

Karin kulan	400
Gargaar	500
HolHol/Bulahar	450
Geeri	500
Biyo Gure	500
Beyodhadher	400
C/dhamasle	300

Appendix 5: Similarity Index Report

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