APRIL 2011

INTEGRATED SMART SURVEY

REPORT

Kibwezi, Makindu and Kathonzweni Districts
&
Kalawa, Nguu, Mulala, Kiou and Malili Divisions,

MAKUENI COUNTY;
KENYA

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LIST OF ABBREVIATIONS AND ACRONYMS

ACF-USA	Action Contre la Faim- USA (Action Against Hunger-USA)
ALRMP	Arid Lands Resource Management Project
ASAL	Arid and Semi-Arid Land
CMR	Crude Mortality Rate
CDC	Centre for Disease Control
DC	District Commissioner
ENA	Emergency Nutrition Assessment
EPI	Expanded Program on Immunization
GAM	Global Acute Malnutrition
GFD	General Food Distribution
GOK	Government of Kenya
IMAM	Integrated Management of Acute Malnutrition
INGO	International Non Governmental Organization
IYCF	Infant and Young Child Feeding
MAM	Moderate Acute Malnutrition
MUAC	Mid Upper Arm Circumference
NCHS	National Centre for Health Statistics
OTP	Outpatient Therapeutic Program
PPS	Population Proportion to Size
SAM	Severe Acute Malnutrition
SFP	Supplementary Feeding Program
SMART	Standardized Monitoring and Assessment of Relief and Transitions
U5MR	Under Five Mortality Rate
W/H	Weight for Height
WFP	World Food Program
WHO	World Health Organization

1 EXECUTIVE SUMMARY

INTRODUCTION

Makueni County is located in the southern end of Eastern Province. It is sub divided into nine districts namely; Makueni, Kathonzweni, Kilungu, Mbooni East, Mbooni West, Kibwezi, Nzaui, Mukaa and Makindu. The county has three main livelihood zones that can generally be summarized into two namely marginal mixed farming and mixed farming (coffee/dairy/irrigation or food crops/cotton/livestock).

The survey covered Kibwezi, Makindu and Kathonzweni Districts and five Divisions (Kalawa, Nguu, Mulala, Kiou and Malili) whose population was estimated at 452, 054[1]. This area lies between Athi River on the East and Mombasa Road on the West and is of the same livelihood.

On the whole, the 2010 short rains started late in the larger Makueni district with the amount of rainfall falling below normal and remaining unevenly distributed[2]. The late onset posed a challenge and has led to critical moisture stress especially the lower marginal mixed farming zone areas of Kathonzweni, Makindu, Nguu and Kalawa leading to near total maize crop failure.

ACF-USA began implementing nutrition activities in three districts of Makueni County in December 2010. These are Kibwezi, Makindu and Kanthonzweni districts. The nutrition program encompasses the following:

- ✓ Building the capacity of MoH health facility staff on management of acute malnutrition
- ✓ Training of community health volunteers on detection and referral of acutely malnourished cases,
- ✓ Promotion of nutrition education

SURVEY OBJECTIVES

The overall objective of the integrated SMART survey was to determine the level of acute malnutrition among children aged 6-59 months, level of mortality in the population, as well as analyze the possible factors contributing to malnutrition such as illnesses, child care practices, WASH and food security.

Specific objectives of were:

1. To assess the prevalence of acute malnutrition in children aged 6-59 months,
2. To estimate the crude and under five retrospective mortality rates,
3. To estimate measles and Vitamin A supplementation coverage
4. To analyze the factors contributing to acute malnutrition such as illnesses and care practices, water and sanitation and the food security and livelihoods situation.
5. To build local capacity on how to undertake surveys

METHODOLOGY

SMART methodology was utilized in both the anthropometric and mortality survey.

Two stage sampling was used. In the first stage, the population of the survey sites was obtained to the smallest geographical unit, being a village. This data was then entered into the ENA software alongside

[1] KNBS 2009 Kenya population and Housing ; VOL 1 A; AUGUST 2010

[2] The Greater Makueni District, Short Rains 2010 assessment Report; 17th – 22nd January 2011

the planning information. Based on the desired precision, prevalence and design effect, 40 clusters were assigned in proportion to population size. 15 households were targeted per cluster.

The second stage involved identification of households. Makueni County is vast and households in most villages were generally far apart. As such, a list of all households in the sampled village was obtained from the village elder. A starting point was randomly selected and thereafter 15 households identified through systematic random sampling.

Questionnaires were administered accordingly in each of the selected households. In each household, all eligible children were measured and all relevant data collected as per the questionnaire.

DATA QUALITY

The enumerators were trained for four days. During this session, both the pilot and standardization test were undertaken. The standardization results indicated poor accuracy and precision in measurements. This thus necessitated the supervisors to undertake an additional session on quality measurements. This coupled with daily supervision and data entry at the field level ensured quality in data collection thence the overall survey score of 4.0%

RESULTS SUMMARY

A total of 590 children were assessed during the survey. However, 17 children were excluded from the final analysis due to out of range data sets. A summary of key findings is tabulated below

Table 1: SUMMARY OF RESULTS

INDEX	INDICATOR		RESULTS
WHO 2005[3] (n =573)	*Z-scores*	**Global Acute Malnutrition** *W/H< -2 z and/or edema*	5.1% (3.3- 7.7 C.I.)
		Severe Acute Malnutrition *W/H < -3 z and/or edema*	0.2% (0.0- 1.3 C.I.)
NCHS 1977 (n= 573)	*Z-scores*	**Global Acute Malnutrition** *W/H< -2 z and/or edema*	5.2% (3.5- 7.7 C.I.)
		Severe Acute Malnutrition *W/H < -3 z and/or edema*	0.0% (0.0- 0.0 C.I.)
	% Median	**Global Acute Malnutrition** *W/H < 80% and/or edema*	2.4 % (1.5 - 4.0 C.I.)
		Severe Acute Malnutrition *W/H < 70% and/or edema*	0.0 % (0.0 - 0.0 C.I.)
MUAC *(n= 562)* *Children 65cm to 110 cm*		**Global Acute malnutrition** *MUAC < 125 mm*	2.0 %
		Severe Acute malnutrition *MUAC < 115 mm*	0.2 %
Total crude retrospective mortality /10,000/day			0.17 (0.06 – 0.48)
Under five crude retrospective mortality /10,000/day			0.35 (0.09 – 1.38)

[3] The WHO and NCHS results in brackets are at 95% confidence interval

Measles immunization coverage *(children >=9 months old, n= 542)*	By card	74.0 %
	According to caretaker/ Recall	22.7 %
	Not immunized	3.3 %
Vitamin A supplementation in the last one year *(n=571)*	Once	44.7 %
	Twice	36.8 %
	Thrice	3.2 %
	None	15.4 %
Coverage of feeding programmes	OTP	0.0 %
	SFP	7.1%
Timely initiation of breastfeeding	Less than an hour	77.2 %
	More than an hour but within 24 hrs	19.4 %
	More than 1 day	3.4 %
Initiation of other foods other than breast milk	Less than 4 months	38.2 %
	Between 4-6 Months	35.9 %
	After 6 months	25.9 %
Morbidity *(Proportion of children aged 6-59 months of age who were sick 2 weeks prior to the survey)*	Fever, cough *(n=164)*	52.4 %
	Fever with chills like malaria *(n=165)*	52.7 %
	Diarrhea *(n=40)*	12.8 %
	Others *(n=72)*	23.0 %
Proportion of households owning mosquito nets		71.1 %
Proportion of households who access safe water source *(n=262)*		45.5 %
Proportion of households who did not practice any form of water treatment *(n=369)*		64.2%
Proportion of households owning livestock *(n=438)*		76.2 %
Proportion of households that had cultivated crops in the previous planting season *(n=538)*		93.6 %
Proportion of households whose primary source of food is purchase *(n=493)*		64.5%
Household dietary diversity score	Low Dietary Diversity (= 3 Food Groups) *n=66*	11.5 %
	Medium Dietary Diversity (4 – 5 Food Groups); *n=117*	20.3 %
	High Dietary Diversity (6+ Food Groups); *n=392*	68.2 %
Average proportion of households whose harvest was less than the previous season		64.1%

1 INTRODUCTION

Makueni County is located in the southern end of Eastern Province. It is sub divided into nine districts namely; Makueni, Kathonzweni, Kilungu, Mbooni East, Mbooni West, Kibwezi, Nzaui, Mukaa and Makindu. The county has three main livelihood zones that can generally be summarized into two namely marginal mixed farming and mixed farming (coffee/dairy/irrigation or food crops/cotton/livestock).

The survey covered Kibwezi, Makindu and Kathonzweni Districts and five Divisions (Kalawa, Nguu, Mulala, Kiou and Malili) whose population was estimated at 452, 054[4]. This area lies between Athi River on the East and Mombasa Road on the West and is of the same livelihood. The area lies within the ASAL region and is generally characterized by erratic rainfall patterns.

Makueni County has two rainy and two dry seasons. This survey was undertaken at the beginning of the long rains (March to May). Most households were observed to be planting in anticipation of better rains. However, the rains in some parts of the county were below expectations.

ACF-USA has been supporting the implementation and running of the Nutrition program integrated in heath structures in three districts of Makueni County for the past few months. The capacity building programmes captures a number of nutrition components such as IMAM and IYCF.

2 METHODOLOGY

2.1 Type of survey

An integrated survey was undertaken in Makueni County. Standardized Monitoring and Assessment of Relief and Transition (SMART) methodology was employed during the survey to undertake both the anthropometric and retrospective mortality survey.

Additional data was gathered at the household level by use of structured questionnaires. Key issues captured in this were food security, WASH, health & health care seeking behavior as well as child care practices.

Market assessment and direct observations were also used to triangulate findings.

2.2 Sampling Methodology

Anthropometric and retrospective mortality data were gathered through a two stage sampling methodology

- **First stage**

ENA for SMART November 2008 version was used during the planning phase.

The most recent population statistics of the survey area was gathered from the District Statistics Office in Makueni County to the smallest sampling unit (village). This, alongside other relevant information such as prevalence rates, design effect, desired precision, non response rates and average household size were keyed into the ENA planning template for cluster determination and assignment.

[4] KNBS 2009 Kenya population and Housing ; VOL 1 A; AUGUST 2010

Table 2: Sample size calculation for anthropometric and retrospective mortality survey

Data entered on ENA software	Anthropometric survey	Retrospective mortality survey
Estimated prevalence	11.3	0.84
Desired precision	3.2	0.45
Design effect	1.5	1.5
Recall period		90 days
Average household size	6	6
Percent of under five children	18	
6-59 months children/household	0.97	
Percent of non-respondent	3	3
Households to be included	**598**	**456**
Children to be included	**564**	
Population to be included		**2656**

Clusters were randomly selected by assigning probability to population size (PPS) using the same software. Thus, 40 clusters each comprising of 15 households. Of the sampled clusters, other clusters were not accessed but rather replaced with the RC's as they were inaccessible. This was because the survey was undertaken at the beginning of the rainy season. This coupled with the black cotton soil in parts of Mukaa division rendered part of the area inaccessible (*Annex 9.1*).

- **Second stage**

This stage involved the selection of households. In each of the sampled villages, a list of all households in the area was obtained from the village elder. Since each team was to assess 15 households per cluster, a sampling interval was determined from the total number of households obtained. A starting point was then randomly selected and subsequent households identified through the calculated sampling interval.

In the selected household, all survey questionnaires were administered accordingly. The respondent was the primary care giver of the index child/children. All children aged 6-59 months were included in the anthropometric survey. In instances where there were no children, the household remained part of the sample that contributed zero children to the nutritional part of the survey. This was recorded on the nutritional data sheet as having no eligible children. If a child and/or the caregiver were temporarily out of the house, then the survey team re-visited the house to collect the data at an appropriate time. When the last house was visited to get the last child in a cluster, and there were several children in the household then all of them were measured; resulting in a larger sample than had been calculated. The mortality questionnaire was administered to all selected households regardless of having a child or not.

2.3 Field Work

The entire survey exercise was undertaken from 14th March to 8th April 2011. A number of activities were undertaken during this period. This included enumerators' recruitment, mobilization for the survey, survey planning at field level, training, data collection *(both primary and secondary data)* and data entry.

Enumerators were first taken through four days of training that covered various survey aspects such as accurate anthropometric measurements, survey methodology, interviewing skills just to mention but a few. Standardization and pilot tests also formed part of this training. The actual survey was thereafter undertaken for 8 days by five teams. Each of the five teams comprised of one team leader from the Ministry of health, two data collectors and two measurers.

Market assessment and observation were also used to augment findings.

2.3.1 Anthropometric survey

The anthropometric survey targeted children aged 6- 59 months. In every selected household, all eligible children were assessed. An anthropometric questionnaire *(see annex 9.3)* was used to gather the required data. This included:

- **Age:** Birth certificates, birth notifications or baptismal cards were used to verify age. In the absence of the aforementioned documents, a local calendar of events was used (Annex 9.3).
- **Sex:** This was recorded as either male (m) or female (f)
- **Weight:** Children were measured in the nude using a 25 kg hanging spring Salter scale to the nearest 100g.
- **Height:** Recumbent length was taken for children less than 85 cm or less than 2 years of age while those greater or equal to 85 cm or more than 2 years of age were measured standing up.
- **MUAC:** Mid Upper Circumference (MUAC) was measured on the left arm, at the middle point between the elbow and the shoulder, while the arm was relaxed and hanging by the body's side. MUAC was measured to the nearest mm. In the event of a disability the right arm was used or for those who are left-handed, MUAC was taken on the right arm.
- **Bilateral Oedema:** This was assessed by the application of moderate thumb pressure for at least 3 seconds to both feet. Only children with bilateral oedema were recorded as having nutritional oedema.
- **Measles vaccination:** Measles vaccination status for children aged 9-59 months was confirmed from their vaccination cards. If no card was available at the time of the survey, the caretaker was asked if the child had been immunized against measles or not. For children with confirmed immunization (by date) on the vaccination card, the status was recorded as "1" (Card) otherwise as "0" (No). Oral confirmation from the mother without proof of card was recorded as "2" (Mother's verification). All children less than 9 months old were excluded from measles analysis.

Other relevant information about the eligible child was gathered. These were:

- **Vitamin A coverage:** This was determined by the number of times the eligible child had received vitamin A in the past year. The response received *(number of times*) was probed and recorded on the anthropometric questionnaire
- **Feeding programme coverage:** Enquiries were made as to whether the child was in any nutrition centre and recorded accordingly. Results were eventually analyzed and used as proxy coverage of the feeding programmes. The direct method was used in estimating coverage thence the use of the formula below:

$$\frac{\textit{Number of respondents attending the feeding programme}}{\textit{Number of cases not attending the feeding programme} + \textit{Number of respondents attending the feeding programme}} \textit{ X 100}$$

- **Morbidity:** Information on two-week morbidity prevalence was collected by asking the mothers/caretakers if the child had been ill in the two weeks preceding the survey; and including the day of the survey. This was eventually determined based on the respondent's recall and was however not verified by a clinician. These were highlighted as diarrhoea, fever with chill like malaria or fever cough with difficulty in breathing. All other forms of illness other than the aforesaid were specified

2.3.2 Mortality survey

Relevant mortality data was gathered in all the sampled 15 households per cluster by use of a standard mortality questionnaire *(Annex 10.4 & 10.5)*. If members of a sampled household were absent/ empty, the teams always inquired about their whereabouts from the neighbors and came back later. No sampled household was replaced.

2.3.3 Food Security, Livelihoods and Water, Sanitation and Hygiene

A structured questionnaire *(Annex 10.7)* was used to obtain the above data from every sampled household. This was regardless of whether the household had an eligible child for the anthropometric survey or not

2.4 Data Quality Control and Assurance

The first step towards ensuring data quality control and assurance was through enumerators training. The survey team underwent a four days training. The training focused on: the objectives of the survey; survey methodology, the meaning of each question; asking and recording of responses accurately; accurate anthropometric measurements and interviewing skills. Standardization test and pilot tests were undertaken during this session. Results of the standardization test indicated weaknesses in terms of accuracy and precision. The survey team was thus taken through an additional session to cover this key component before they proceeded for the pilot test. The survey methodology, data collection tools and process was undertaken during the pre test.

Close monitoring and supervision of all five survey team were undertaken on daily basis. This was undertaken at the field level with daily data entry of both the anthropometric and mortality data set. At the beginning of each day, the survey supervisors had a brief session with the survey team to discuss the previous day's work and plausibility report. The plausibility and validity check up for the quality of raw data is presented in *Annex 10.9*.

2.5 Data Entry and Analysis

Anthropometric and mortality data were analyzed in ENA for SMART software November 2008 version.
Daily data entry was undertaken for the anthropometric and mortality data sets so as to ensure close supervision and quality of data as the survey progresses. This data set was eventually analyzed. For the anthropometric data sets, extreme vales flagged by the software were excluded from the final analysis

The household questionnaire data sets were entered and analyzed using SPSS Version 13.0 and Microsoft Excel

3 INDICATORS, GUIDELINES AND FORMULAS USED

- **Acute Malnutrition**

Weight for Height Index

The acute malnutrition rates were estimated from the weight for height (WFH) index values combined with the presence of oedema. This index was compared with the WHO Standards and NCHS reference and expressed in both Z-scores and in percentage of median. The expression in Z-scores has true statistical meaning and generally allows inter-study comparison whereas the percentage of median generally identifies eligible children for feeding programmes.

Guidelines for the results expressed in Z-scores:

- Severe malnutrition is defined by WFH <-3 SD and/or existing bilateral oedema
- Moderate malnutrition is defined by WFH <-2 SD and >=-3 SD and no oedema

Guidelines for the results expressed in percentage according to the median reference:

- Severe malnutrition is defined by WFH < 70% and/or existing bilateral oedema on the lower limbs
- Moderate malnutrition is defined by WFH < 80% and >=70% and no oedema

The Global acute malnutrition (GAM) in this report is therefore expressed as the proportion of children presenting with a WFH index less than -2 Z scores or less than 80% percent of the median with/without oedema.

Mid Upper Arm Circumference

MUAC is a rapid assessment tool of malnutrition. It also acts as a good predictor of mortality. The table below indicates the various criteria for MUAC

Table 3: Definition of MUAC

MUAC Guideline	Interpretation
MUAC<115mm and/or bilateral pitting edema	Severe Acute Malnutrition with high risk of malnutrition
MUAC >=115mm and <125mm	Moderate acute malnutrition with risk of mortality
MUAC >=125mm and <135mm	Risk of malnutrition
MUAC > 135mm	Adequate nutritional status

- **Mortality**

Ninety days recall period was used to collect mortality data. SMART methodology was utilized in data entry and calculation of crude and under five mortality rates. The result is expressed per 10,000 people per day. It is calculated using the following formula.

Crude Mortality Rate (CMR) = 10,000/a*f/ (b+f/2-e/2+d/2-c/2), where:

a = Number of recall days (90)
b = Number of current household residents
c = Number of people who joined household
d = Number of people who left household
e = Number of births during recall
f = Number of deaths during recall period

Crude Mortality Rate (CMR):

Alert level: 1/10,000 persons/day
Emergency level: 2/10,000 persons/day

Under five Mortality Rate (U5MR):

Alert level: 2/10,000 persons/day
Emergency level: 4/10,000 persons/day

4 SURVEY LIMITATIONS/CONSTRAINTS

The nutrition survey was a cross sectional study. This means that it gives the nutritional status of a given area at a given time. The causes of malnutrition also highlighted in this report are the probable causes of malnutrition as no causal analysis studies were undertaken.

Some of the sampled survey sites were inaccessible due to heavy rains that had occurred during the survey period.

QUANTITATIVE AND QUALITATIVE RESULTS

This section presents the results and discussions based on the data on nutrition status of children aged 6-59 months, mortality with 90 days recall period and the immediate and underlying causes of malnutrition including morbidity, water and sanitation, and food security and livelihoods related indicators. Quantitative results are presented in the tables and graphs.

5 RESULTS OF THE ANTHROPOMETRIC SURVEY

5.1.1 Distribution by age and sex

Of the 573 children assessed, 49.2% were boys while 50.85 were girls. The overall ration of boys to girls of 1.0 falls within the recommended range of 0.8 – 1.2[5] demonstrating an unbiased sample as a whole.

Table 4: Distribution of age and sex of sample

	Boys		Girls		Total		Ratio
Months	**no.**	**%**	**no.**	**%**	**no.**	**%**	**Boy: girl**
6-17	52	46.4	60	53.6	112	19.5	0.9
18-29	75	51.4	71	48.6	146	25.5	1.1
30-41	59	45.7	70	54.3	129	22.5	0.8
42-53	66	52.4	60	47.6	126	22.0	1.1
54-59	30	50.0	30	50.0	60	10.5	1.0
Total	282	49.2	291	50.8	573	100.0	1.0

The sex ratios across all the various age groups were within acceptable range. There is no statistical significance in the risk of malnutrition between boys and girls as p value 0.501 is >0.05.

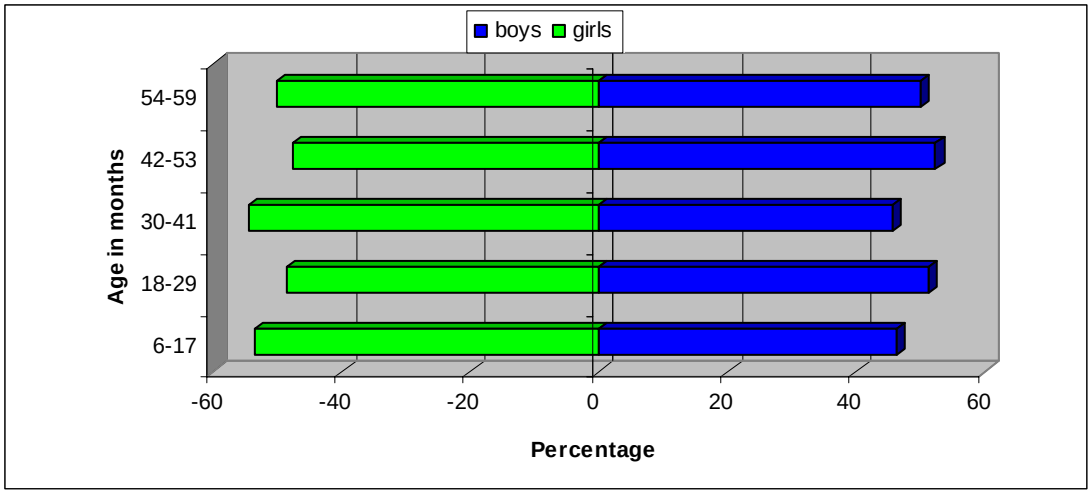


Figure 1: Distribution of sex by age group

[5] Assessment and Treatment of Malnutrition in Emergency Situations, Claudine Prudhon, Action Contre la Faim (Action Against Hunger), 2002.

5.1.2 Anthropometry

5.1.2.1 Distribution of Acute Malnutrition in Z-score, WHO and NCHS references

The table below shows the distribution of acute malnutrition by age group in z-score and/or oedema as per WHO standards. As tabulated below, no cases of severe malnutrition were reported with 5.2% of the children being moderately wasted

Table 5: Prevalence of acute malnutrition by age based on WHZ-scores and/or oedema, WHO references

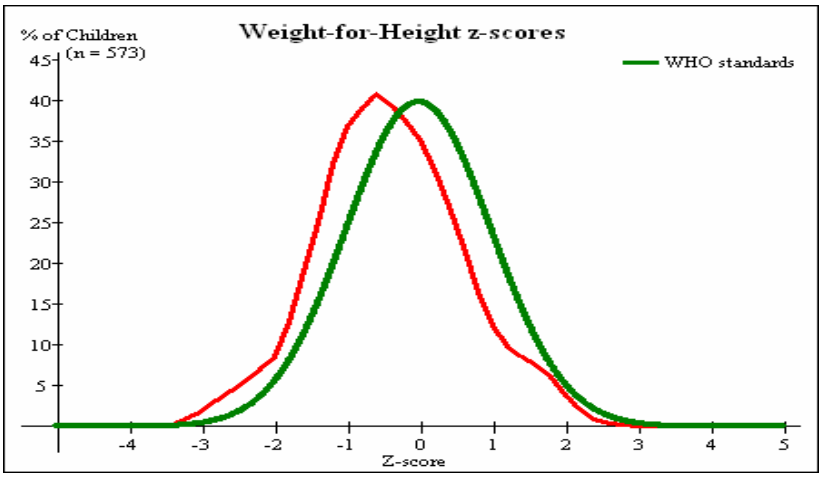
		Severe wasting (<-3 z-score)		Moderate wasting (>= -3 and <-2 z-score)		Normal (> = -2 z score)		Oedema	
Age *(mths)*	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	112	0	0.0	3	2.7	109	97.3	0	0.0
18-29	146	0	0.0	9	6.2	137	93.8	0	0.0
30-41	129	0	0.0	5	3.9	124	96.1	0	0.0
42-53	126	0	0.0	11	8.7	115	91.3	0	0.0
54-59	60	0	0.0	2	3.3	58	96.7	0	0.0
Total	573	0	0.0	30	5.2	543	94.8	0	0.0

Further analysis of the WHZ was done based on the presence or absence of bilateral oedema. These findings are presented below. On the whole, no marasmus or kwashiorkor cases were reported

Table 6: Distribution of acute malnutrition and oedema based on weight-for-height z-scores

	<-3 z-scores	**>=-3 z-scores**
Oedema present	Marasmic kwashiorkor No = 0 (0.0 %)	Kwashiorkor No = 0 (0.0 %)
Oedema absent	Marasmic No = 0 (0.0 %)	Not severely malnourished No = 573 (100.0 %)

The figures below are a representation of the weight for height distribution curve of the anthropometric survey. Figure 1 compares the results to the WHO standard whereas figure 2 makes the comparison with the NCHS standards. In both figures, the sampled population curves show a slight displacement to the left of the reference curve. This is an indication of poor nutritional status.



The standard deviation of 0.99 *(WHO standards)* fall within the acceptable range

Figure 2: Weight for Height distribution in Z-score compared to the WHO standard

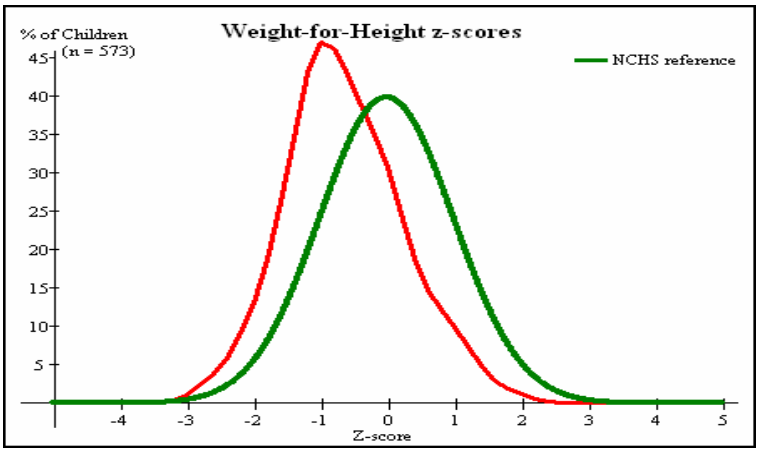


Figure 3: Weight for Height distribution in Z-score compared to the NCHS references

The GAM unveiled fell below both the emergency and alert thresholds of 15.0% and 10.0% respectively. This was also the case with SAM that fell way below the emergency (4.0%) and alert (2.0%) thresholds. These findings have been expressed at 95.0% confidence intervals in the table below.

Table 7: Global and Severe Acute Malnutrition in Z-score

	WHO Reference	NCHS Reference
Prevalence of GAM	5.1% (3.3- 7.7 C.I.)	5.2% (3.5- 7.7 C.I.)
Prevalence of SAM	0.2% (0.0- 1.3 C.I.)	0.0% (0.0- 0.0 C.I.)

5.1.2.2 Distribution of Acute Malnutrition in Percentage of the Median, NCHS reference

Table 8: Prevalence of malnutrition by age, based on weight-for-height percentage of the median and oedema

		Severe wasting (<70% median)		Moderate wasting (>=70% and <80% median)		Normal (> =80% median)		Oedema	
Age (mths)	**Total no.**	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
6-17	112	0	0.0	1	0.9	111	99.1	0	0.0
18-29	146	0	0.0	5	3.4	141	96.6	0	0.0
30-41	129	0	0.0	2	1.6	127	98.4	0	0.0
42-53	126	0	0.0	5	4.0	121	96.0	0	0.0
54-59	60	0	0.0	1	1.7	59	98.3	0	0.0
Total	573	0	0.0	14	2.4	559	97.6	0	0.0

5.1.2.3 Distribution of Middle Upper Arm Circumference

Table 9: MUAC distribution

MUAC in mm	>=65 cm to < 75 cm height		>=75 cm to < 90 cm height		>= 90 cm height		Total	
	N	**%**	**N**	**%**	**N**	**%**	**N**	**%**
MUAC < 115	0	0.00	1	0.40	0	0.00	1	0.18
115 = MUAC < 125	4	4.65	4	1.62	2	0.87	10	1.78
125 <= MUAC < 135	22	25.58	23	9.31	20	8.70	65	11.55
MUAC.>= 135	60	69.77	219	88.66	208	90.43	487	86.50
Total	**86**	15.28	**247**	43.87	**230**	40.85	563	100.00

6 RESULTS OF RETROSPECTIVE MORTALITY SURVEY

Mortality data was collected retrospectively over a 90 days recall period. A mortality survey questionnaire was used for both the household and cluster. Based on information gathered from 587 households, the crude and under five mortality rates were calculated. During the survey period, all the households included in the anthropometric survey were considered for mortality data regardless of whether they had children 6-59 months or not.

A total of 3721 people were present in the assessed households. 17.5% (653) of these were children under five years of age. In terms of household movements, 341 and 47 people left or joined the household respectively. Children under five years of age formed a negligible portion of these movements with only 4.1% (14) leaving and 23.4% (11) joining the various households during the recall period

A total of 31 births and 6 deaths had occurred during the survey period. Two of these deaths were children under five years of age. Malaria was reported as the cause of death of one of these. However, no clinical evidence was shown to attest to this

Based on the above information, the calculated retrospective mortality rates were:

- Crude mortality rate: **0.17 (0.06 – 0.48) /10,000/day.**
- Under five mortality: **0.35 (0.09 – 1.38) /10,000/day.**

7 RESULTS OF QUALITATIVE ASSESSMENT

Other than the anthropometric and mortality data, additional data was gathered through a structured household questionnaire. The questionnaire was administered in all sampled households. Key issues captured in this questionnaire included household demographics, health and health seeking behaviour, food security and livelihood and WASH. This section thus presents these findings in addition to other health components such as vitamin A supplementation, measles and feeding programme coverage

7.1 SOCIO-DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

A number of factors determine a household's nutrition status. These include income and expenditure just to mention but a few. In this survey, a household was defined as a person or group of persons related or unrelated by blood, residing in the same compound, having one household head and eating from the same pot. A total of 575 households were interviewed during this survey. Based on this and the total number of people present during the survey of 3721, the average household size was 6.4. The number of males and females in the households was also determined during this survey. As such, the average number of this per household is 3.1 and 3.4 respectively.

Of the 575 households assessed, 84.0% (483) and 16.0% (92) were headed by men and women accordingly. Only 71.8% of these households had children under five.

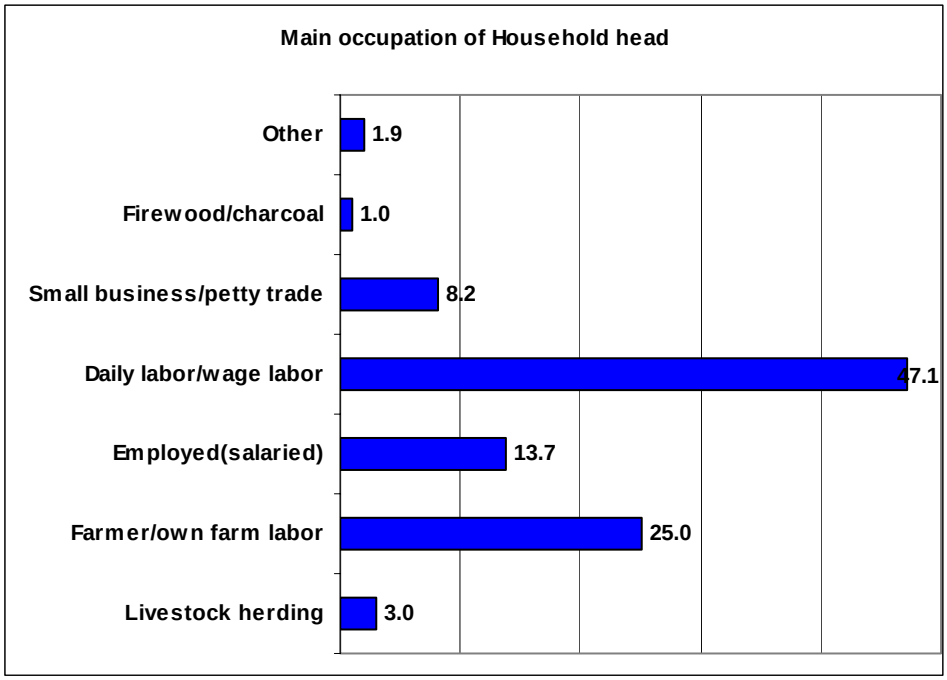


Figure 4: ***Main occupation of household head***

The cost of living in Kenya is gradually on the increase. This increment is felt across the country with Makueni County not being an exception.

In the surveyed area, permanent job opportunities were rare. This accounted for only 13.7%.

Daily/waged labour was however the predominant (47.1%) occupation of household heads followed by own farm labour (25.0%). *(See fig 4)*

7.2 HEALTH AND NUTRITION

The survey captured a number of information so as to correlate and probably understand the relationship between health and nutrition. This section represents the findings on morbidity amongst children under five years of age, measles and vitamin A supplementation coverage as well as the coverage of selective feeding programmes

Of the 575 households sampled, only 71.8% had children less than five years of age. A two weeks recall was used to determine episodes of illness. More than half (70.2%) of these children had been ill. As shown in the ***figure 5*** to the right, fever coupled with other symptoms was the main cause of illness. This was followed by other illness such as influenza and skin infection.

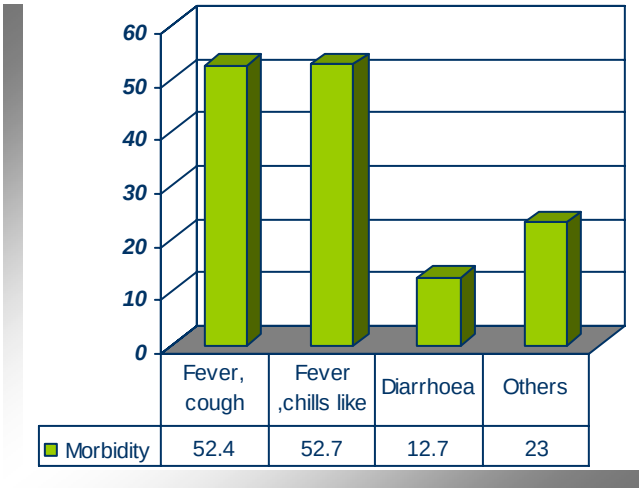


Figure 5: ***Causes of morbidity***

Over two thirds (83.4%) of caretakers sought health care for the sick children. This was done at various places with slightly more than half (57.2%) going to the public clinic. Other households sought care at the private clinic (22.6%), shop/kiosk (16.9%), mobile clinic (3.7%), traditional healer (2.9%), CHW's (2.1%), relatives (0.4%) or local herbs (0.8%) in that order. This raises concern about the quality of care as issues such self medication arises.

Appropriate child care practises are also necessary to ensure sound nutrition status of all individuals within the household. This should also be the case for vulnerable persons such as children under five years of age as they are in a critical growth and development phase. This begins right from birth all through the years of development. As such, timely initiation of breastfeeding and exclusive breastfeeding of infants are key issues of adherence. In the surveyed areas of Makueni County, most (77.2%) mothers initiated breastfeeding in less than an hour after birth. 19.4 % initiated after an hour but within 24 hours with 3.4% doing this after a day. The table below indicates that close to a quarter (25.9%) of children were exclusively breast fed. However, it is important to note that this could be more of knowledge than practise thence even lower rates. This is because information gathered was mostly based on recall.

Table 10: Exclusive breastfeeding rates

Initiating foods other than breast milk/ EBF rates	%
Less than 4 months	38.2
Between 4-6 Months	35.9
After 6 months	25.9

The table further indicates that complementary food was introduced early to infants. This was mostly (74.1%) done before six months of age with 38.2% giving other foods at less than 4 months. The type of food given to these infants was also of concern as less than half (47.2%) of children less than five years but not breast feeding took milk. Overall, the exclusive breastfeeding and weaning practices are inadequate and need to be promoted at both health facility and community level.

Measles is an infectious disease that has a direct relationship with the nutrition status of a child. During the survey period, measles vaccination status was gathered and this was based on recall or an

immunization card. Analysis was then done for children aged 9 months and above and findings tabulated below.

Table 11: Measles Vaccination Coverage

Response	N	%
Immunized by card	401	74.0
Immunized by recall	123	22.7
Not immunized	18	3.3
>=9 months	**542**	**100.0**

Most cases of recall were identified in Kalawa division. In this area, the caretakers had very little knowledge on the importance of the child welfare cards. It is also important to note that cases of "funny" rashes likely to suggest measles were noted in most of the children in Makindu and Kibwezi districts. The disease surveillance units of the various areas were informed through the survey team leaders. Nevertheless, the immunization coverage by both card and recall are satisfactory according to the 80% WHO recommended coverage in order to avoid epidemic.

Vitamin A coverage was assessed by first describing what a Vitamin A capsule looked like then asking the mother if the child received the content of that capsule in the past one year.

Table 12: Vitamin A Coverage

	N	%
Once	255	44.7
Twice or more	228	40.0
None	88	15.3
Total	571	100.0

The rates of supplementation for the children who had received Vitamin A at least twice was 40.0%. This is below the target in Kenya of 50% and quite of concern bearing in mind that Malezi bora campaigns had been undertaken twice in May and November 2010.

Malaria is a disease of public health concern in sub Saharan Africa. In Kenya and across the region, a number of strategies have been employed to fight malaria with promotion of the use of mosquito bed nets taking centre stage. A few years ago, the long lasting insecticide treated nets used to be distributed to the pregnant, lactating and under five for free at the health facility. This initiative is nonetheless not in place any more and households are required to buy. Mosquito bed net ownership in the survey site was at 409(71.1%). However, usage by all household members was just slightly above 50.0% with only 67.5% and 68.9% children and adult females respectively sleeping under a mosquito bed net the night to the survey. Working on the assumption that the adult females are either pregnant or lactating, risk of vulnerability to malaria increases. The low bed net coverage could probably explain morbidity attributed to fever with chills like malaria that contributed over 50.0% of cases.

The coverage of feeding programmes is estimated using various methods. This can either be directly or indirectly. The direct method was used to and was based on children categorized as undernourished by the weight for height Z score. The recovery rates at these programmes were also reported to be low by the District Nutrition officers in the area. This was attributed to increase in sharing of food ration at the household that eventually increased chances of re-admission.

Table 13: Coverage of feeding programmes

	%
OTP	0.0
SFP	7.1

Even though coverage surveys can best determine these rates, the proxy levels unveiled by the direct method are low. An in depth analysis of the data further indicated that some children were in either the OTP (5) or SFP (9) yet they were way above the admission criteria. This then raises the issue about knowledge on various issues of IMAM.

7.3 FOOD SECURITY AND LIVELIHOODS

Makueni County lies in the Arid and Semi arid region of Kenya. This area is characterized by extreme rainfall variability. The County has two rainy seasons and two dry seasons. The short rains usually occur between late October and December whereas the long rains are usually expected between March (mid) and April. It is thus important to note that the survey data collection exercise was undertaken during the long rainy season. However, as experienced while on ground, the rain was intermittent and probably below average. The short dry spells on the other hand are experienced between January and early March with the long dry spells projected to occur in June- early October.

Almost all (93.6%) households planted food crops in the previous planting season in November and they largely (93.6%) depended on the rains to water them. However, the October- November long rains were reported to be below average. *Figure 6* presents the crops planted along with the percentage of those farmers who planted the crops that experienced complete crop failure and harvested nothing.

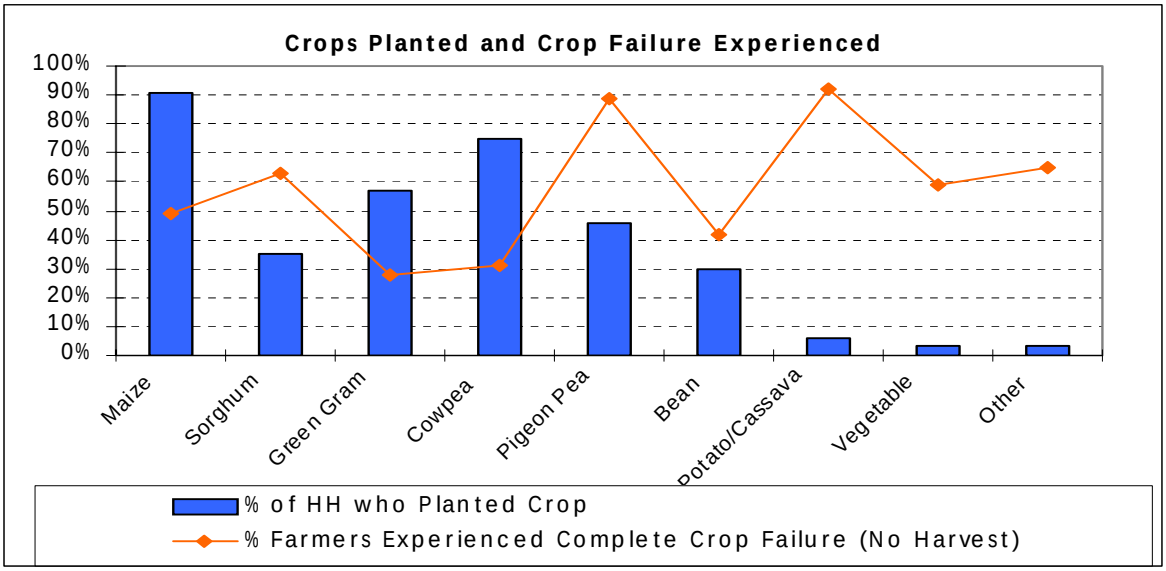


Figure 6: Crops planted and crop failure experienced

Maize is the primary crop grown, both in terms of the number of farmers who plant it and the acreage under production, which explains the fact that it is the crop harvested in the largest quantities (*See Figure 6 above*). Green gram, cowpea and pigeon pea were planted by at least 40% of the population, whereas potato/cassava and vegetables were planted by very small minorities (less than 10%). It is clear from the graph above that all crops were subject to significant failures, with maize, sorghum, pigeon pea, potato/cassava and vegetables subject to failures of 50% or more. Green gram, cowpea and bean crops were relatively the most successful in terms of the percentage of those growing them achieving at least some harvest indicating they were perhaps best adapted to the local conditions, including the poor rainfall experienced.

Farmers were asked to compare their most recent harvest with the season prior to that. An analysis of this *(see Figure 7 below)* indicated that almost all households reported a decline in the amount of harvest save for a few crops such as potatoes, cassava and vegetables (which were grown by relatively few households). For all the major crops the majority reported a decrease in harvest, although it should be noted that despite this some households experienced an increase in harvest comparative to the previous season.

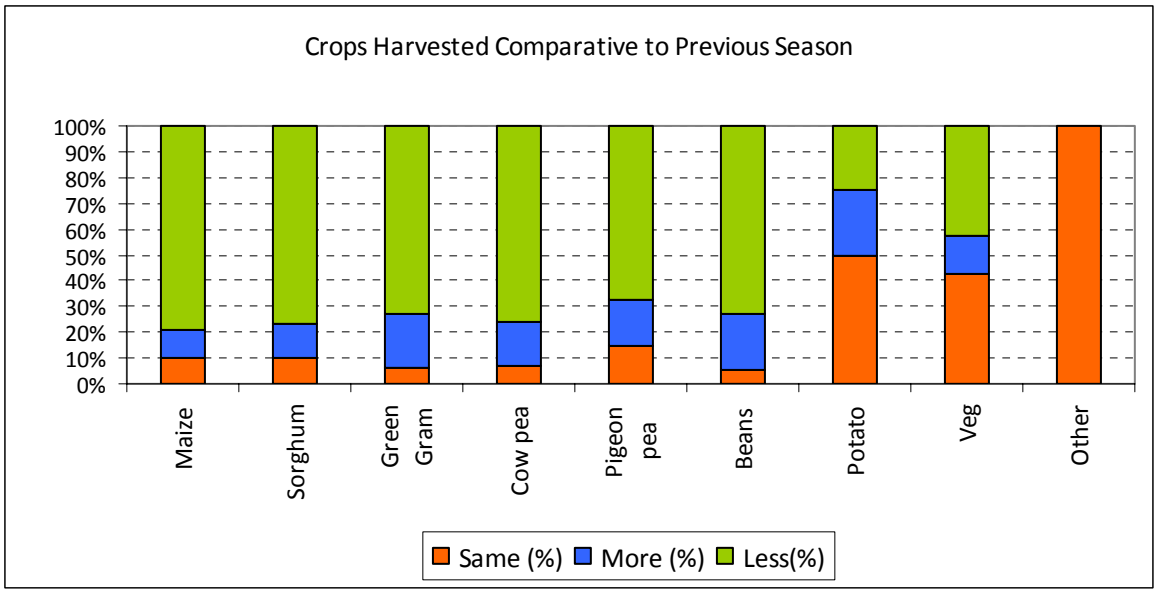


Figure 7: Crop harvest compared to the previous season

Figure 8 details the average and median quantities harvested per crop both for all farmers who planted the crop, and amongst those who managed at least some harvest. Because of the high incidence of crop failure the median harvest amongst all those who planted a particular crop was zero in most cases. Equally the averages amongst all farmers are lower than when only those who had some harvest are analysed. It is interesting to note that the average is significantly higher than the median for all crops which is as a result of relatively small numbers of farmers with large harvests skewing the results upwards. This is most extreme in the cases of maize and vegetables and may be due to commercial scale farming. For the most part the median harvests are probably more reflective of the situation experienced by the average smallholder farmer in the surveyed areas.

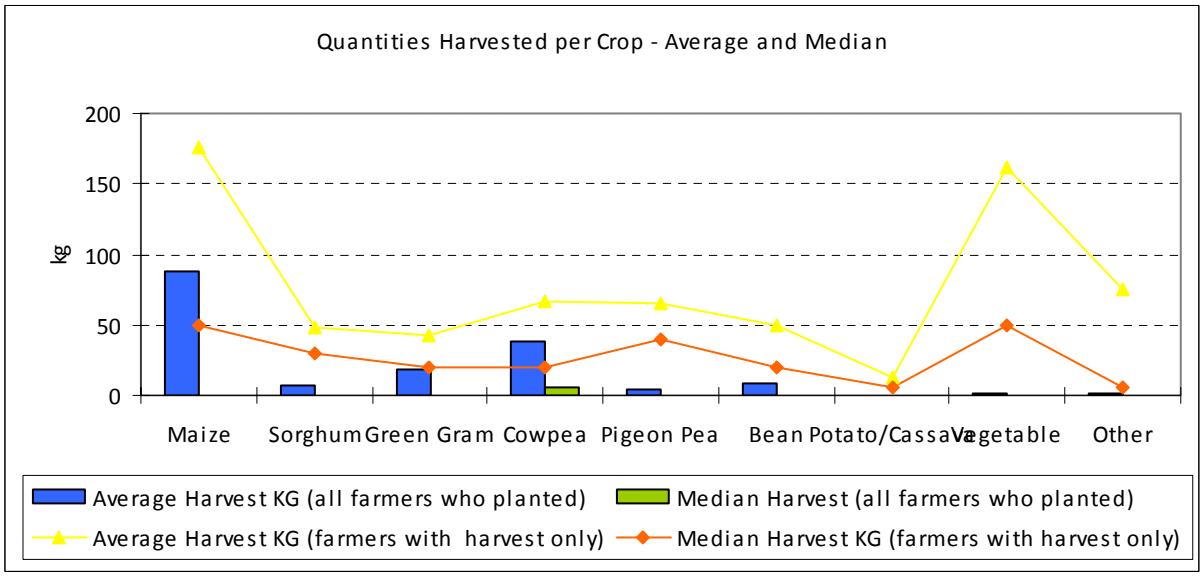


Figure 8: Quantity of harvest per crop

Increments or decline in the quantity of harvest were noted. This varied from one crop to the other based on a number of reasons. For example, increase in harvests was partly attributed to more seed available or better seed quality planted. Some of these seeds were also drought tolerant so could withstand the harsh environment. As observed during the data collection exercise, seeds were being distributed by the government and other agencies in the area.

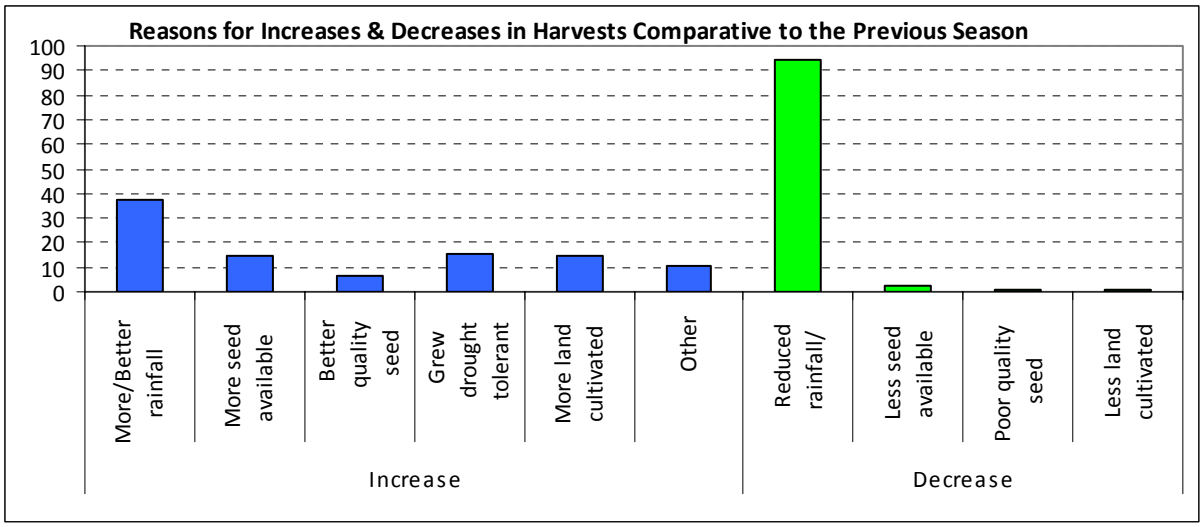


Figure 9: Reasons for increase or decrease in harvest

Decline in harvest on the other hand was predominantly attributed to reduced rainfall as illustrated in the figure above. Poor seed quality, less seed and land cultivated also contributed to the poor harvests but were cited in only a very small number of cases.

76.2% of the population reported owning livestock. The table below details the average number of livestock owned per household.

Table 14: Average number of livestock /HH

Livestock	Average number/household
Cattle	2
Goat	7
Sheep	1
Donkey	0
Chicken	11

Dietary diversity is a measure of household food access and food consumption. Dietary diversity was measured using the Household Dietary Diversity Score (HDDS). A 24 hour recall of the 12 main food groups was carried out. The survey results indicated that cereals (90.3%) such as ugali, sugar (83.3%) and condiments (82.8%) were the most frequently consumed of the food groups. Most body building foods except milk were rarely consumed. For example fish and meat accounted for 4.2% and 6.4% respectively. (See *figure 10* below)

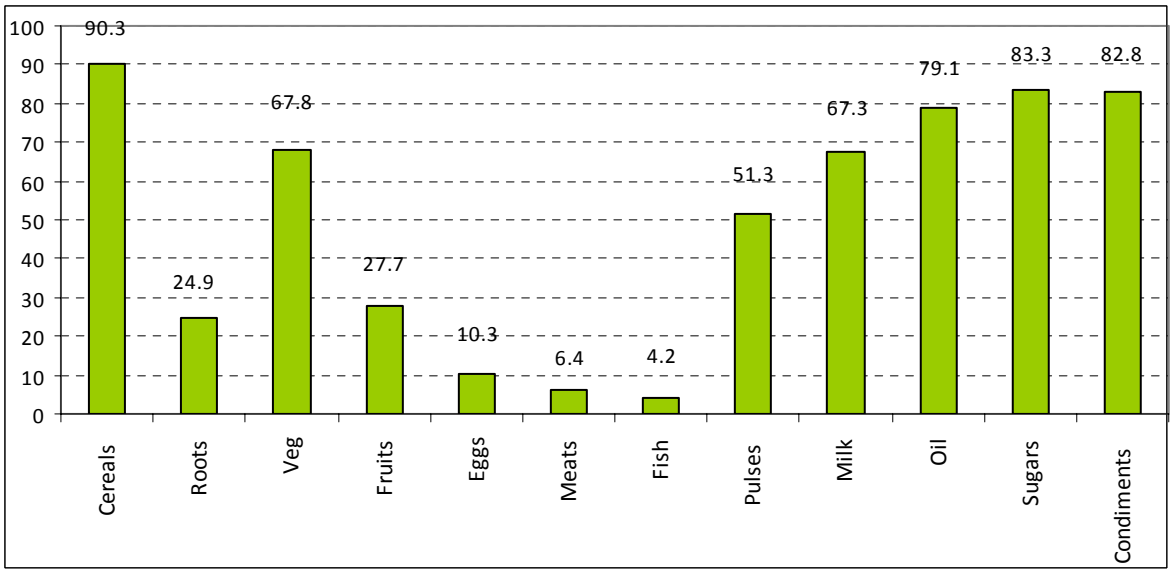


Figure 10: 24 hour recall on the 12 food groups

The table below further shows the distribution of the households according to HDDS category, revealing that the majority fall within the higher dietary diversity group (6 or more food groups consumed)

Table 15: Household Dietary Diversity scores

Food Dietary Diversity	N	%
Low Dietary Diversity (= 3 Food Groups)	66	11.5%
Medium Dietary Diversity (4 – 5 Food Groups)	117	20.3%
High Dietary Diversity (6+ Food Groups)	392	68.2%
Total	575	100.0

Food sources in the household were determined through proportional piling with a 30 day recall period; the results are displayed in Figure 11. Purchase was the single most important source, accounting for over 50% of all food. In addition nearly 10% of food was purchased on credit, meaning that in combination with direct purchase, over 65% of food is sourced from the market, which is of some concern given increasing food prices. Own production (crops and livestock) accounts for just less than 30% of food, although it is likely this will decline over the coming months until the next harvest period, thereby further increasing reliance on the market at least in the short term. Food aid, received from the government and WFP, accounted for around 5% of household food, although nearly 30% of households receive it indicating the quantities may be relatively small.

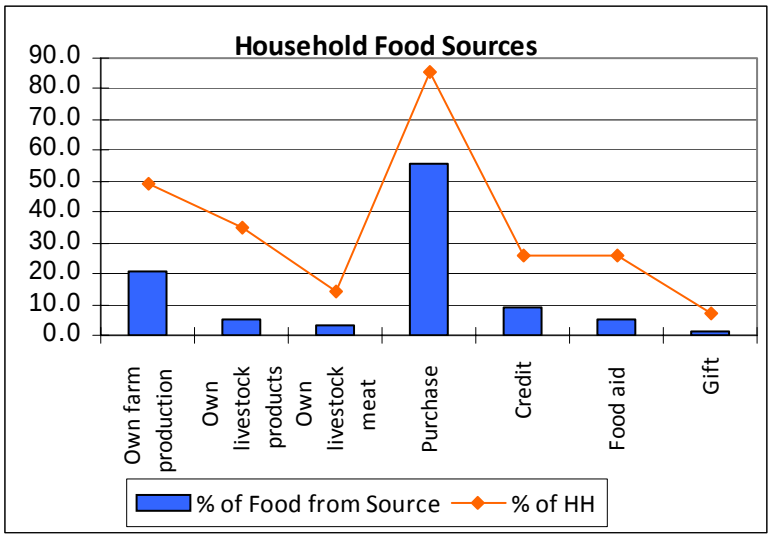


Figure 11: Household food source

Most (52.9%) households reported that their most recent harvest would provide 1 to 2 months worth of food for household consumption. In terms of current food stocks 27.4% had food stocks that would last for more than two months, whilst 19.4% had supplies for less than one month. The reduction in crop harvests coupled with the limited duration of the present food stock indicates a strain on existing resources. This in most cases would necessitate households to adopt various measures to cope with the hard times. The survey probed households on what measures they have taken in the past thirty days to deal with the situation. Eating less preferred food was the most common coping strategy. Other strategies of importance frequently employed included meal size reduction, restricting adult food intake, skipping meals and borrowing money.

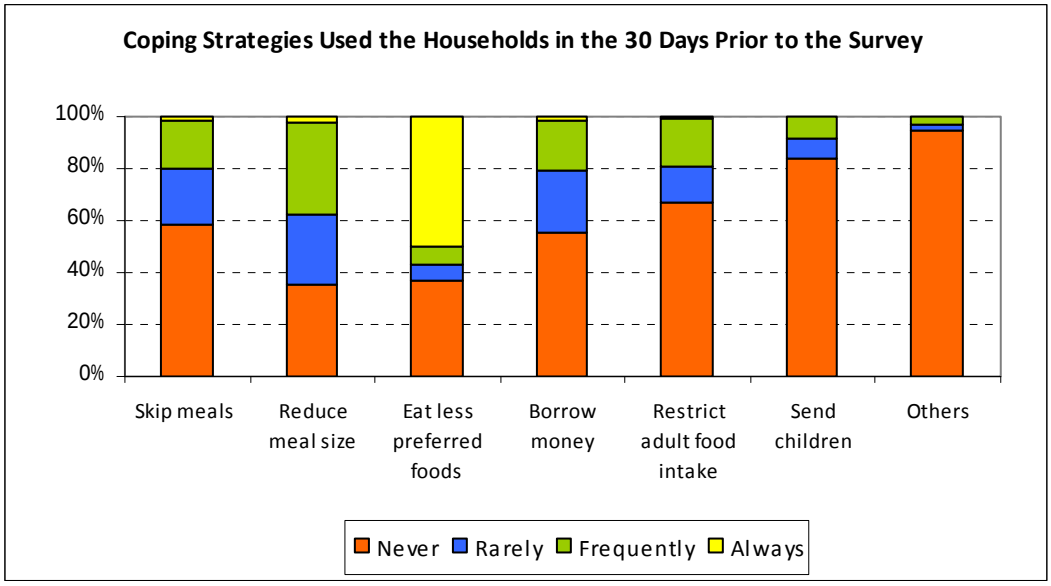


Figure 12: Household coping strategies

Most households had experienced some shocks in the three months prior to the survey. These varied from one site to the other. The shocks reported were thereafter ranked in order of importance and the results indicated below. As indicated, crop failure was ranked as the first and second highest shock and was experienced by 70% of the households. Other shocks of significance reported were unusually high food prices, reduced water availability, reduced income and earning opportunities

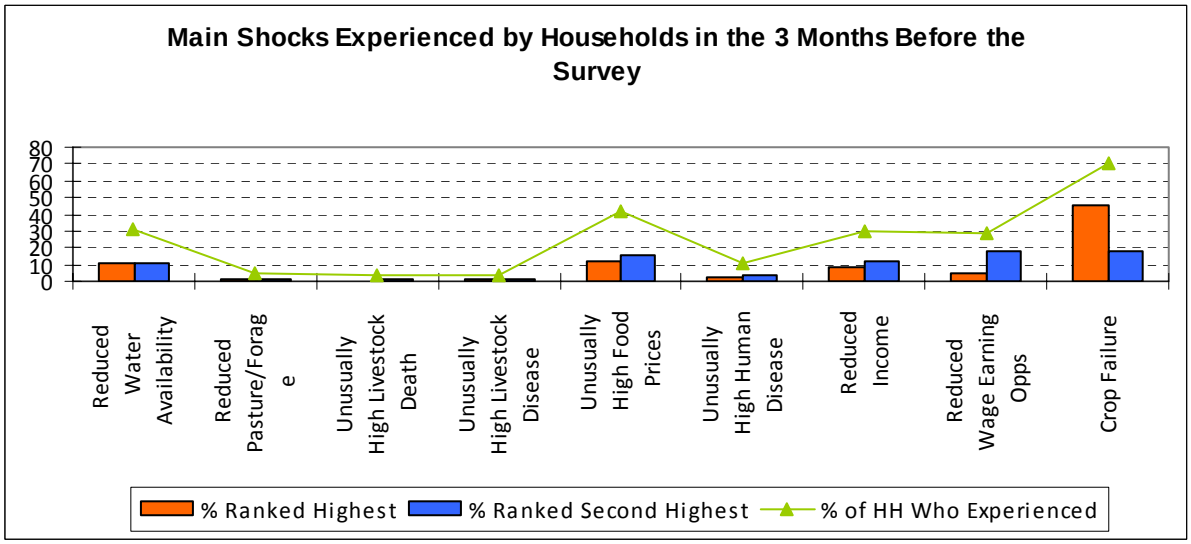


Figure 13: Shocks experienced in order of priority

Decreased ability to have enough food (92.8%) /income and loss of assets (91.9%) were some of the problems experienced due to the above mentioned shocks. Despite the aforementioned effects of the shocks, 41.0% of households did nothing to cope with the highest shock. Other households however sought alternative sources of income (12.7%), sold animals (10.2%), ate less (10.0%), spent savings (5.1%), spent days without meals (4.7%) or reduced expenditure on food/non food items (4.8%). Borrowing (1.4%), reliance on food aid (0.8%), credit (1.8%) and sale of large animals (0.8%) were also practised by part of the community. As at the time of the survey, 71.0% had not recovered from the shocks with only 22.4% reporting partial recovery.

Income sources in Makueni County were diverse although unskilled labour was reported as the main source of income by a significant majority. This accounts for 50% of all income, with over 70% of households engaged in unskilled labour. None of the other sources of income accounts for more than 10% of total income. Amongst these sale of agricultural and livestock products and livestock are the most commonly utilised (in excess of 20% of the respondents) as indicated in the graphical presentation.

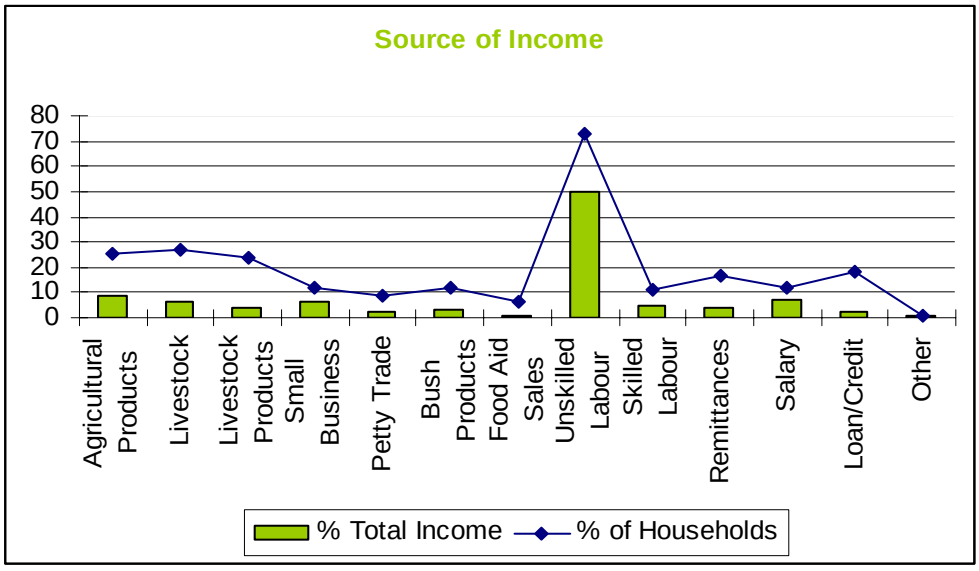
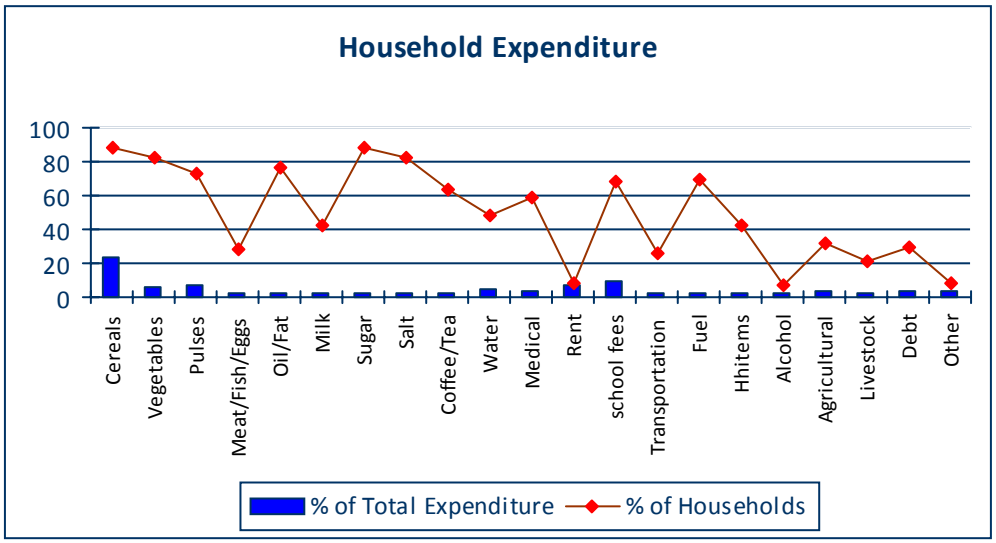


Figure 14: Source of income



Expenditure levels were also diverse based on the different settings. On the whole, cereals, school fees, rent and pulses accounted for a relatively larger portion of the total expenditure.

Figure 15: Household expenditure

However, most household expenses were on cereals, sugar, salt and vegetables as indicated in the graphical presentation above.

The results of the survey indicate that the food security situation in the study area is precarious and likely to deteriorate over the coming months, specifically until the next decent harvest can be realised. The combination of high dependence on market purchase for food and on unskilled casual labour as a source of income indicates that food access may be strained in the coming months for many households, particularly as food prices increase. Daily wage rates are generally low, resulting in poor purchasing power. Despite the fact that a large portion of households had cultivated in the previous season, the vast majority relied on rain to water this. Based on the fact that rainfall has been erratic in the area, most of the harvests were less as compared to the previous planting season and crop failure was common. The aforementioned factors are bound to predispose households to food insecurity. This situation is also expected to worsen in the near future as household stocks are expected to last less than a month.

7.4 WATER SANITATION AND HYGIENE

Water access, availability and safety are key components and determinants of nutrition. Makueni County lies in the arid and semi arid region as such characterized by inadequate reliable rainfall. The assessment was carried out at the inter phase between dry season and wet season. At the time of the survey, majority of locations were at their peak of dry season. Major event that occurred before the survey was short rains assessment for 2011 which indicated poor performance of the short rains. Although there was adequate recharge during the short rains, open water sources were noted to be dry.

Water access
The various water sources noted during the survey period are tabulated below.

Table 16: Water accessibility

Main sources of Water	N	%
Piped water system from borehole (Safe)	121	21.0
Piped water system from spring(Safe)	107	18.6
Unconstructed traditional shallow well on dry river	39	6.9
Unconstructed traditional shallow well not on the river	41	7.1
Constructed shallow well without hand pump	112	19.5
Constructed shallow well with working hand pump(safe)	34	5.9
Secondary water seller	11	1.9
Water trucking to public tank	12	2.1
Earth pan/ dam	1	0.2
Household roof rain catchment	90	15.7
Flowing river	6	1.0
Other	1	0.2
Total	**575**	**100.0**

On the whole, majority (54.5%) of households consume unsafe water from shallow wells, traditional hand pumps, secondary water seller, water trucking or from earth pans with less than half (45.5%) of using safe water.

It is worth noting that it rained during the survey period thence the 15.7% households whose water source was roof catchment at the time of survey. This is a temporary water source as it depends on the rains.

SPHERE standards recommend a minimum of 15 liters of water per person/day while the Kenya national standards is at least 20 liters per person/day. These were the basis upon which the survey findings compared to the data collected on amount of water consumed.. Results indicate that 81.2% and 89.7% of the sampled households did not meet the standards the SPHERE and national standards respectively as shown in *figure 16* below.

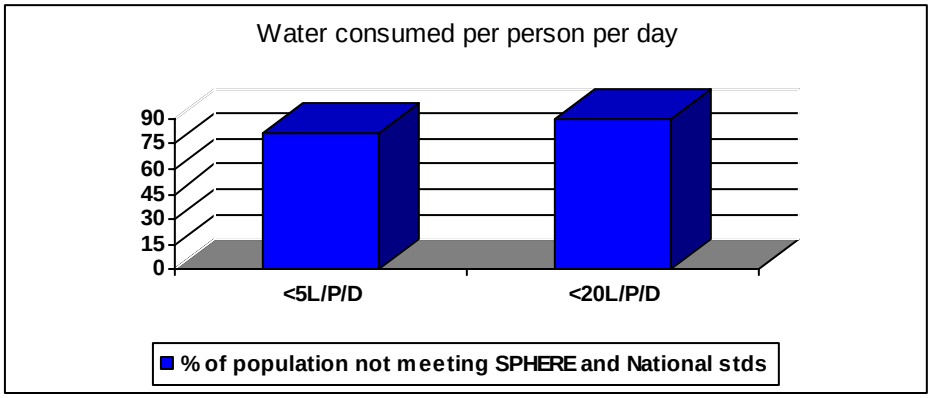
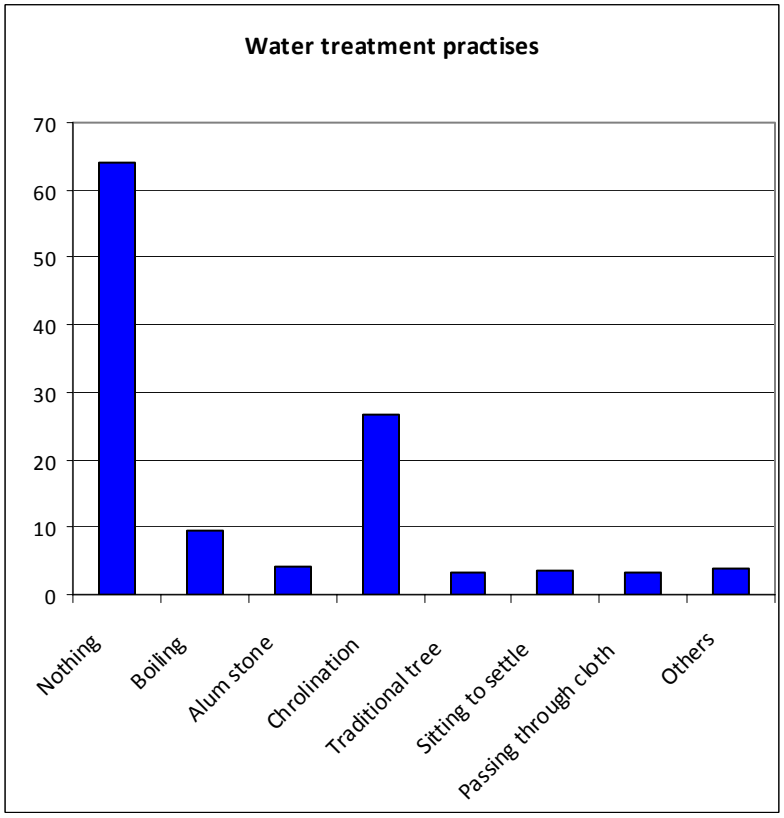


Figure 16: Quantity of water consumed per person per day

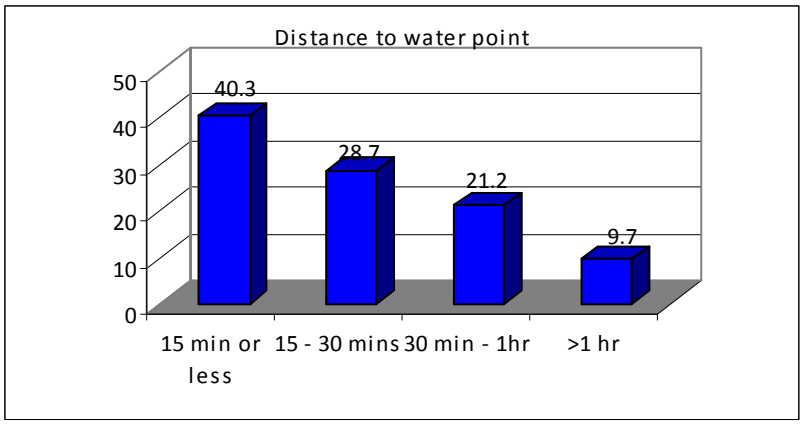
Water treatment:



Water treatment in the surveyed area was a concern as survey finding reveals that most (64.2%) households did nothing to the water before consumption. This was despite the fact that unsafe water formed the predominant source of water. Other water treatment options were chlorination (26.8%, boiling (9.6%), alum stone (4.2%), sitting to settle (3.5%), traditional tree (3.3%) and passing through cloth (3.3%). The drinking water was predominantly (94.8%) stored in closed pots or containers.

Figure 17: Water treatment methods

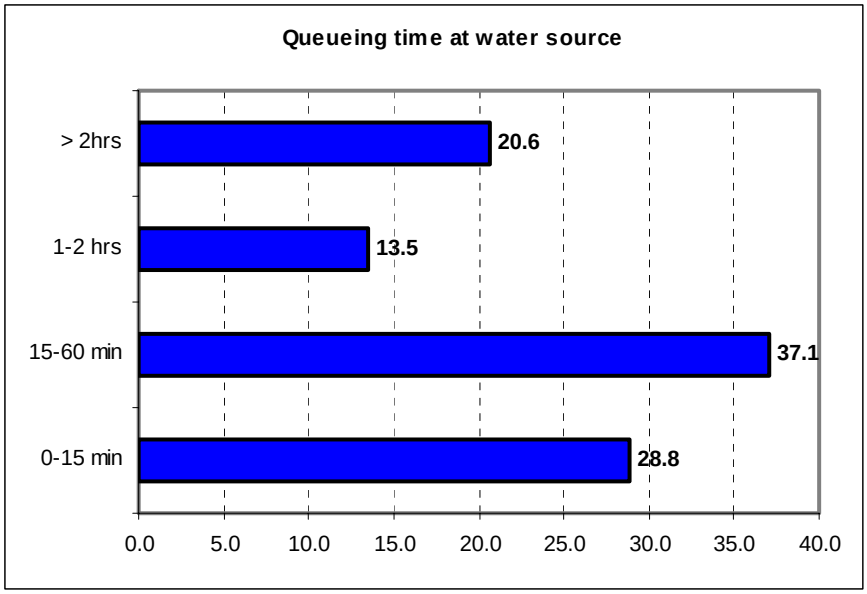
Every individual has a right to water. This should not only be safe but sufficient, affordable and accessible for personal and domestic use. SPHERE 2004 recommends a maximum distance of 500 meters/ 15 minutes from a household to the nearest water point.



The figure to the left indicates that majority (40.3%) of the households did not have to walk for more than fifteen minutes to the water source. However, if those who were to travel for more than 15 minutes were to be consolidated, then the proportion would be larger (60.0%). This would eventually be above the SPHERE 2004 standard.

Figure 18: Distance to water point

Other than distance to water points, 46.4% households still had to queue at the water point with the queuing time varying within households as shown in the *figure* below.

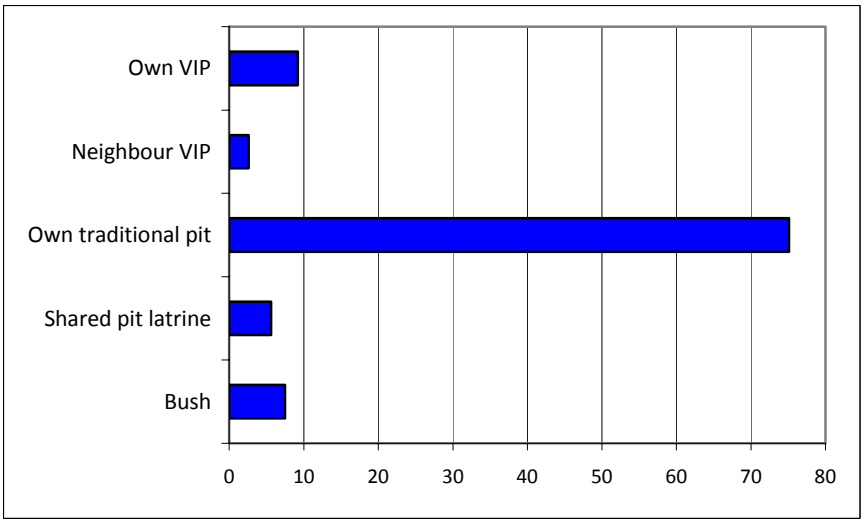


This time varied at various water points. For example, those households that fetched water from flowing rivers generally did not have to line up for long as compared to those who purchased water from secondary water sellers.

This brings up the issue of purchase of water which 57.6% of households did. As reported by most households; the price of a twenty litre jerican of water ranged between 2-3 shillings.

Figure 19: Queuing time at water source

Sanitation:
Sanitation and hygiene are critical to health, survival, and development. Lack of basic knowledge and facilities to support these predisposes a community/ individuals to infections. In the surveyed area of Makueni County, majority (75.1%) of households relieved themselves in their own traditional pit latrines with 9.2% (53) using their own ventilated improved latrine.



Sharing of latrines was also reported by only 8.2%. This indicates a large proportion (92.5%) of households using safe excreta disposal methods. Observations were made on the type of slab and cleanliness of the latrines. 85.4% of these were clean with the floors covered in traditional slabs (75.4%) or cement (24.6%)

Figure 20: Relieving points in Makueni County

Hygiene Practises:
In order to assess hygiene and sanitation, the survey looked at hand washing practices before and after particular events. This is an important aspect as it helps eliminate the faecal-oral route of infection transmission. Hands washing before eating, after visiting the toilet and before cooking were the most

reported events. These accounted for 82.3%, 79.1% and 67.1% respectively. Other relatively important hand washing times reported were before breastfeeding (22.1%), after handling animals (22.6%) or taking children to the toilet (23.5%), when dirty (23.0%) or before going to the latrine (11.3%). This is represented in the figure below.

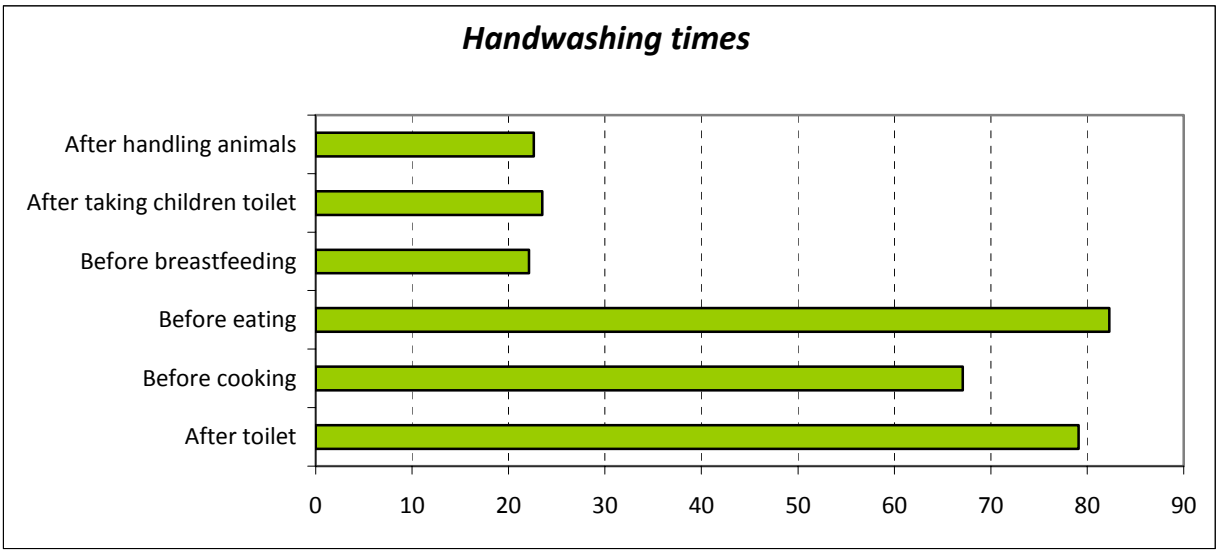


Figure 21: Hand washing practises

Even though a number of hand washing times were noted, a significant portion (33.0%) did not wash their hands. Water (29.7%), soap (69.4%) or ashes (0.9%) were used while washing hands and in some cases what was used was dependent on a household's economic status. For example, of the households who reported to use soap, 27.3% only used this in times that they could afford it.

In a nut shell, the water and sanitation situation in the surveyed area still requires some consolidated effort so as to maintain or better still reduce the unveiled malnutrition rates. This is because majority of household's access unsafe water with poor water treatment practices. A significant portion also practiced open defecation. This coupled with poor hand washing practices and economic constraints that limit purchasing power of some items such as soap predisposes the community to water related illness and eventually malnutrition.

8 DISCUSSION AND CONCLUSIONS

Assessment of the prevalence of acute malnutrition in children aged 6-59 months was one of the objectives of the SMART survey. As per WHO growth standards 2005, GAM rate of 5.1 %(3.3-7.7) and SAM rate of 0.2 %(0.0-1.3) fall below the emergency thresholds of 15% and 4% respectively. Moreover, none of the sampled children was diagnosed with bilateral oedema. Though the survey results indicate that the nutritional status is relatively at the acceptable range, there is need of more efforts in maintaining or reducing the unveiled malnutrition rate in Makueni County. The survey was conducted in March, two months after the short rain's harvest indicating that the population had some food stock at household level and adequate market supply which could be related to the low GAM and SAM rates. However, long rains in most parts of Makueni County has already failed, thus malnutrition rate is expected to increase in the subsequent months. There are quite a number of agencies in Makueni County with ACF being one of the major Nutrition Actors. The feeding program coverage is very low with OTP and SFP accounting for 0.0% and 7.1% respectively. However, some children were reported to be in the feeding programs yet they were way above the admission criteria indicating that capacity building on IMAM should be strengthened.

Most of the care givers reported to have appropriate Infant and Young Child Feeding Practices with 77.2% initiating breastfeeding in less than an hour after birth and 25.9% introducing complimentary food after six months which is still inadequate. Most of the care givers were also noted to have had adequate knowledge on child care practices; however practise in relation to this was questionable necessitating the need to have a strategic approach on IYCF preferably at the household level.

Morbidity is an immediate cause of Mortality and Malnutrition. Of the sampled children 0-59 months, 70.2%had been ill two weeks prior to the survey date with fever with chills like malaria accounting for 52.7%. This can be attributed to lack and minimal usage of few available mosquito nets by most vulnerable groups. The health care seeking behaviour amongst some households was also poor. This is attested by the significant portion that depended on other areas for medical other than health facilities such as traditional healers, kiosks as well as self medication. Moreover, vitamin A coverage doesn't meet the national target of 50% despite the two Malezi bora campaigns in 2010.

The food security situation in the area is poor. The survey was undertaken during the long rainy season. However, these rains were reported to be below expectations and as experienced during the exercise, the rainfall was intermittent. This poses a challenge current food stock as most households rely only on rain to water their produce in the farms. Past household harvests were also reported to be below expectations mainly due reduced rainfall. This situation is further aggravated by factors such as low purchasing power, large household size and shocks such as crop failure and unusually high food prices. The aforementioned necessitated the community to put up some measures to buffer these effects. As such most households reported to reduce meal size, eat less preferred foods or even reduce expenditure on food and non food items. The household dietary diversity score was above six. However, this score was increased by consumption of condiments and sugars at the expense of other important food groups such as proteins and body building foods.

The water and sanitation situation was also not any better. The biggest concern in regard to water access is amount available to the households for consumption and safety of water being consumed. Quality of water is made worse by lack of water treatment in majority of households. This is exposing the community at risk of water borne disease. From the variety of water sources available, main water sources are ground water and considerable spring water. The water sources are can be noted to be very far from households since they are mainly point water sources as indicated by the travel time to fetch water. This is denying the community members enough time to engage in other productive activities. A significant number of households are under emergency levels of concerns in terms of safe water access. This is in contrast to the efforts geared to achieving millennium development goals for the community. Sanitation and hygiene would be rated to score better than access to safe water. This is demonstrated by the majority of the household having their own pit latrines and culture of hand washing being strong. The

main challenge is on material available to the household for hand washing which requires assessment and promotion of alternative choices.

9 RECOMMENDATIONS

Malnutrition rates in Makueni County fall below the emergency levels. Nevertheless, concerted efforts by the various stakeholders need to be undertaken by the various stakeholders in the area if not to reduce but at least to maintain the situation within acceptable levels. The following are thus recommended based on the survey findings.

Health and Nutrition

- ✓ Intensify capacity building issues on IMAM while strengthening the extant community strategy with nutrition components for maximized output
- ✓ Strengthen IYCF issues to translate the knowledge into practice as well as explore the feasibility of undertaking a KAP study on this component
- ✓ Strengthen/ increase the number of sites of targeted feeding programmes especially in an area such as Kibwezi District that appeared to be relatively worse
- ✓ There should be protection ration for the SFP and OTP beneficiaries which will help to minimize the cycles in the feeding programs. It was noted that there is a lot of sharing at household level for the rations given to the beneficiaries thus recovery rate is low. Moreover, once a child is discharged from the program, there is no enough food at home thus after a short while the child is readmitted again to the feeding program.

Food Security & Livelihoods

- ✓ Establish linkage between general food distribution and other targeted feeding programs so as to minimize chances of re-admissions in the various targeted feeding programs.
- ✓ Look at the feasibility of establishing a surveillance system in the area to monitor the changes in food security and analyze the factors affecting this over time.
- ✓ The presence of seasonal and permanent rivers provides the potential to increase irrigated crop production and reduce the reliance on rain fed production as a result. In addition suitable yet sustainable methodologies should be sought to ensure adequate food harvest and supply at the household level such as drip kit irrigation and kitchen gardening.
- ✓ Support income generation and small business development in order to increase the sustainability, diversity and size of household incomes.
- ✓ Distribution of good quality seed to vulnerable farmers who have experienced crop failure in order to address short term gaps in household seed availability as a result of poor production.
- ✓ Promote increased planting of drought tolerant crop varieties (e.g. cowpea and green gram) which have performed demonstrably better during periods of low and erratic rainfall in the area.

Water, Sanitation and Hygiene

- ✓ Educate the community on appropriate water treatment measures to increase access to safe water at house hold level.
- ✓ Enhanced education focusing on utilization of mosquito bed nets especially amongst vulnerable groups so as to minimize incidence of disease related to this.
- ✓ Promote water supply systems that will ensure water treatment at the source and provision or extension of water supply lines near the population to reduce on time spent on water collection.
- ✓ Identification and promotion on sustainable alternative materials for hand washing in the community.

10 ANNEX

10.1 Sample Size and Cluster Determination[6]

Geographical unit	Population size	Cluster
Nguthunu	584	1
Munyalo	228	2
Ngomeni	276	3
Nthungululu	290	4
Kanyonga	251	5
Kwakilomo	332	6
Ngiluni	333	RC
Ngumo/Kiteei	513	7
Katulani	304	8
Kanyonga	476	9
Ngulu	500	10
Silanga kwa makio/Maiatune	603	11
Kathiani/Kivuthini	564	12
Kiaoni	373	13
Pipeline	251	14
Mbembani	551	15
Mukanda	457	16
Yumbuni	465	17
Kamunyuni	530	18
Kavingoni	388	19
Silimbi	285	RC
Central/Munyenze	540	RC
Likoni	376	20
Kiwanzani 'A'/Kiwanzani B	494	21
Kathekani	232	22
Mukuluni	220	RC
Yiiaitune/Katangini/Katapani	559	23
Menthooko	403	24
Itooni/Miangeni	351	25
Muusini/Mukame	364	26
Mindani	404	27
Kwa Wandeto	436	28
Tabora	300	29
Nduundune	413	RC
Ngamyone	503	30
Mukuku/Mukelenzu	571	31
Mutanda	388	32
Nganwa	452	33
Kikome	370	34
Kyusyani	319	35
Enguli	372	36
Makwa A	208	37
Kwale B	428	38
Maawa	672	39
Nzeveni	574	40

[6] Only the sampled and reserved clusters have been presented in this section.

10.2 Anthropometric Survey Questionnaire

ACF/Kenya Mission: MAKUENI SMART Survey Anthropometric Form (MARCH –APRIL 2011) 6-59 months old children

1. Identification: Data Collector:_____ Team Leader:_____

1.1 Larger District	1.2 Division	1.3 Location	1.4 Sub-location	1.5 Cluster No	1.6 Team Number	1.7 Survey Date

Child no.	HH no.	Sex (F/M)	Age in Months	Weight ##.# kg	Height ###.# cm	Weigh-for-height Z Score	Oedema (Y/N)	MUAC ##.# cm	Measles Vaccination 0= Not immunized 1= Card 2= Mothers verification	In the last one yr, how many times has the child received Vitamin A	Is the child in any Nutrition center? 0= No 1= OTP 2= SFP	In the past two weeks did the child suffer from any sickness? 0=No 1= Yes	If yes, which sicknesses			
													Diarrhea 0= No 1= Yes	Fever with chills like malaria 0= No 1= Yes	Fever, cough, difficult breathing 0= No 1= Yes	Other (specify) 0= No 1= Yes
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2																
3																
4																
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15																

10.3 Calendar of Events

CALENDER OF EVENTS MARCH 2011

MONTH	Seasons	2006	2007	2008	2009	2010	2011
JANUARY	SHORT DRY SPELL (NGETHA)		50	38 POST ELECTION VIOLENCE	26	14	2
FEBRUARY			49	37 SIGNING OF NATIONAL ACCORD	25	13	1
MARCH			48	36	24	12	0
APRIL	LONG DRY SPELLS (MBUA YA UUA)	59	47 EASTER SEASON	35 EASTER SEASON	23 EASTER SEASON	11 EASTER SEASON	
MAY		58	46 LABOUR DAY CELEBRATIONS	34 LABOUR DAY/TETANUS CAMPAIGN IN MKN	22 LABOUR DAY CELEBRATIONS	10 LABOUR DAY CELEBRATIONS	
JUNE	LONG DROUGHT (THANO MUASA)	57 MADARAKA CELEBRATIONS	45 MADARAKA CELEBRATIONS	33 MADARAKA CELEBRATIONS	21 MADARAKA CELEBRATIONS	9 MADARAKA CELEBRATIONS	
JULY		56	44	32	20	8 WORLD CUP	
AUGUST		55	43	31	19 NATIONAL CENSUS	7 REFURUNDUM	
SEPTEMBER		54	42 Mass secondary school strike in MKN	30	18	6	
OCTOBER	SHORT RAINS (MBUA YA NTHWA)	53 MOI/ KENYATTA DAY CELEBRATIONS	41 MOI/ KENYATTA DAY CELEBRATIONS	29 MOI / KENYATTA DAY CELEBRATIONS	17 KENYATTA DAY CELEBRATIONS	5 KENYATTA DAY CELEBRATIONS	
NOVEMBER		52	40 INTENSIFIED ELECTION CAMPAIGN	28 OBAMA WINS US ELECTIONS	16	4 MALEZI BORA CAMPAIGNS	
DECEMBER		51 JAMHURI DAY CHRISTMAS SEASON	39 GENERAL ELECTION	27 JAMHURI DAY (12TH) CHRISTMAS SEASON	15 JAMHURI DAY (12TH) CHRISTMAS SEASON	3 JAMHURI DAY (12TH) CHRISTMAS SEASON	

10.4 Household Mortality data form (One sheet per Household)

Household enumeration data collection form for a death rate calculation survey (One sheet/household)

District :_____Division:_____Location:_____Village: _____

Cluster number:_____HH number:_____Date:_____Team number:_____

	1	2	3	4	5	6	7
ID	HH member	Present now	Present at beginning of recall (include those not present now and indicate which members were not present at the start of the recall period)	Sex	Date of birth/or age in years	Born during recall period?	Died during the recall period
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							

Tally (these data are entered into Nutrisurvey for each household):

Current HH members – total		
Current HH members - < 5		
Current HH members who arrived during recall (exclude births)		
Current HH members who arrived during recall - <5		
Past HH members who left during recall (exclude deaths)		
Past HH members who left during recall - < 5		
Births during recall		
Total deaths		
Deaths < 5		

10.5 Household Mortality data form (One sheet per Cluster)

CLUSTER MORTALITY QUESTIONNAIRE (one sheet/cluster)

District: _____Division:_____Location: _____Village: _____

Cluster number:_____Date:_____Team number: _____

HH	Current HH Member		Current HH Member Who Arrived During Recall (Exclude Births)		Past HH Members Who Left During Recall (Exclude Deaths)		Births During Recall	Deaths During Recall	
	TOTAL	<5	TOTAL	<5	TOTAL	<5		TOTAL	<5
1									
2									
3									
4									
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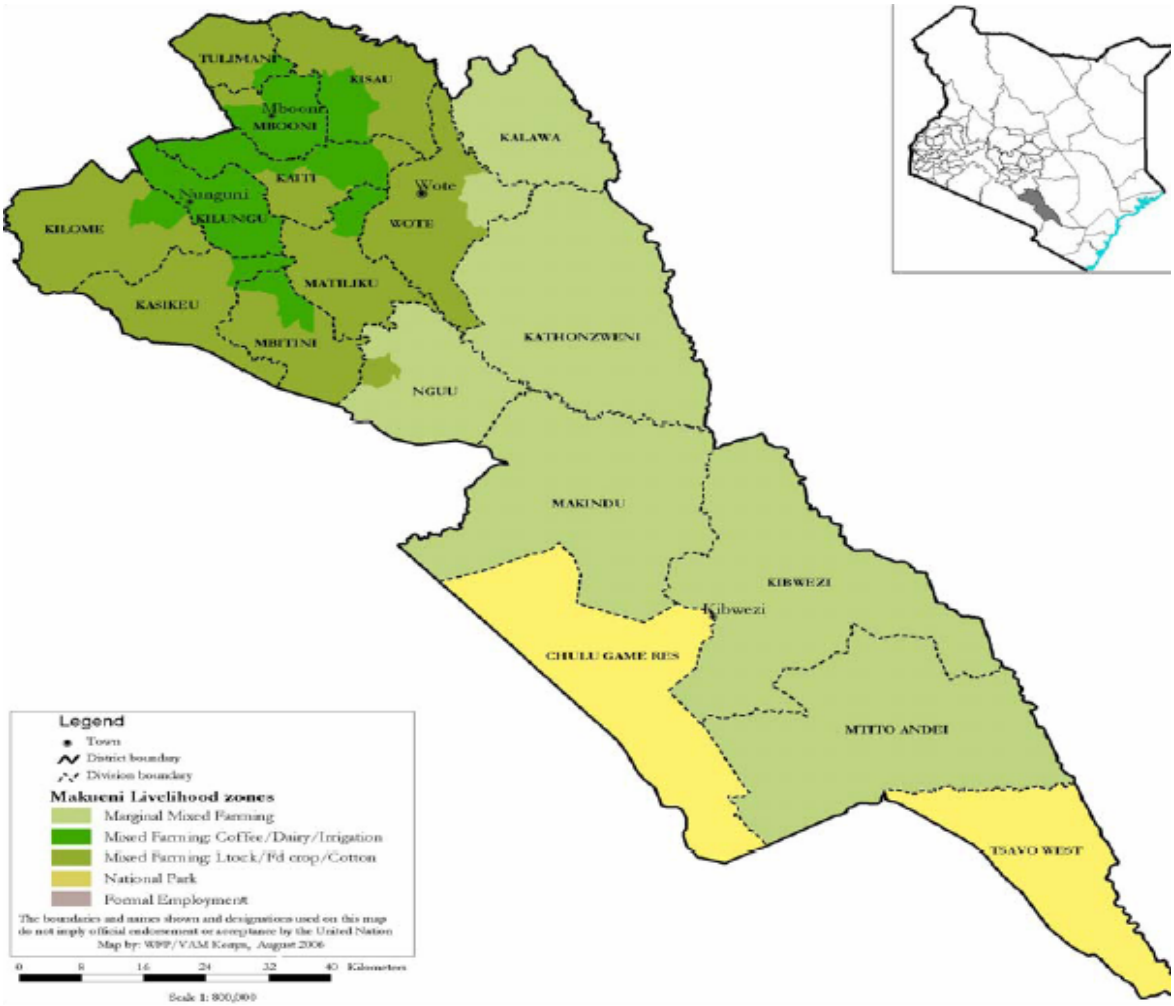
10.6 Map of Study Areas Makueni County



10.7 Household questionnaire

1. Identification	**Data Collector**_____	**Team Leader**_____					
1.1 District	1.2 Division	1.3 Location	1.4 Sub-location	1.5 Cluster No	1.6 HH No	1.7 Team No.	1.8 Date

2. Household Structure		
2.1	**Sex of household head** 1. Male 2. Female	|____|
2.2	**What is the main occupation of the household head** 1. Livestock herding 2. Farmer/own farm labor 3. Employed (salaried) 4. Daily labor/Wage labor 5. Small business/Petty trade 6. Firewood/charcoal 7. Other (Specify _____	|____|
2.3	**How many household members are currently present** 1. Male 2. Female	|____| |____|

3. Child Health and Nutrition (Children 0-59 months of age) –(The mother/caretaker should be asked for this section)		
3.1	**Does the household have children 0-59 months old?** 1. Yes 2. No (if No, skip to section 4)	|____|
3.2	**Did any of your children 0-59 months old have had sickness during the past 2 weeks?** 1. Yes 2. No (If No, skip to Question # 3.6)	|____|
3.3	**If yes to question 3.2 what type of sicknesses during the past 2 weeks (Multiple response possible)?** 1. Diarrhea 2. Vomiting 3. Fever with chills like malaria 4. Fever, cough, difficult in breathing 5. Other (specify)_____	|____| |____| |____| |____| |____|
3.4	**When the child was sick did you seek assistance?** 1. Yes 2. No (If No, skip to question # 3.6)	|____|
3.5	**If the response is yes to question # 3.4 where did you seek (More than one response possible- Use 1 if Yes and 2 if No)** 1. Traditional healer 2. Community health worker 3. Private clinic/ pharmacy 4. Shop/kiosk 5. Public clinic 6. Mobile clinic 7. Relative or friend 8. Local herbs 9. NGO/FBO	|____| |____| |____| |____| |____| |____| |____| |____| |____|

3.6	**In the last 24 hours did the child (ren) who is < 5 years and is not breastfeeding receive milk?** 1. Yes 2. No |____|
3.7	**Ask Questions 3.7 & 3.8 if there is child <2 years in the household (otherwise skip to section 4).** When did you begin breastfeeding the youngest child after birth? 1. Less than one hour 2. More than one hour but within 24 hours |____| 3. More than one day
3.8	At what age in MONTHS did the youngest child receive food other than breast milk? (Foods include other milk, water, fruit, juices, artificial drinks, sugar water solutions, porridge, etc.) 1. Less than 4 months 2. Between 4-6 months |____| 3. After 6 months

4. Water, Sanitation and Hygiene (WASH)/- Ask the mother/care taker	
4.1	**What is the main source of drinking water for the household <u>NOW</u>?** 1. Piped water system from borehole |____| 2. Piped water system from spring 3. Unprotected shallow well in a *laga* or scooping into *laga* 4. Unprotected shallow well (NOT in *laga*), un-constructed or constructed but OPEN with no working hand pump 5. Protected shallow well with a working hand pump 6. Earth pan/dam 7. Earth pan/dam with infiltration well 8. Roof rain catchments 9. Underground tank or birkad filled by rain (Rural) 10. River, flowing 11. Water trucking to birkad or tank 12. Water seller, donkey cart or other seller 13. Other (specify)__
4.2	**How long does it take to walk to the main source of water (one way in minutes) NOW?** 1. 15 minutes or less (less than 500m) 2. 15 minutes to 30 minutes (1km) |____| 3. 30-1 hour (more than 1km – 2 km) 4. More than one hour (more than 2 km)
4.2.2a	**Do you queue for water?** 1. Yes |____| 2. No **(If No skip to question 4.3)**
4.2.2b	**If yes how long?** 1. 0-15 minutes |____| 2. 15-60 minutes 3. 1-2hrs minutes 4. More than 2 hours
4.3	**What is done now to the water before household members drink the water NOW? (MULTIPLE RESPONSES POSSIBLE- (*Use 1 if NO and 2 if YES)*** 1. Nothing |____| 2. Boiling |____| 3. Alum stone |____| 4. Chlorination |____| 5. Abarmog (traditional tree) |____| 6. Sitting to settle |____| 7. Passing through cloth |____| 8. Other (specify_____) |____|
4.3.1	**Where do you store water for drinking?** 1. Open pot / Jerrican |____| 2. Closed pot / Jerrican 3. Any container
4.4	**How much water did your household use YESTERDAY (excluding for animals)?** *(Ask the question in the number of 20 liter Jerrican and convert to liters & write down the total quantity used in liters)* |_____|

4.5	**Do you pay for water?** 1. Yes 2. No **(If No skip to Question 4.6)**	|____|
4.5.1	**If yes, how much 20ltr Jerrican (per 20 liters jerrican) _____ksh/20ltrs**	
4.6	**When do you wash your hands? (MULTIPLE RESPONSE-** (Use 1 if "Yes" and 2 if "No") 1. Does not wash hands 2. Does not wash hands at any special time, when they are dirty. 3. Before latrine and other times not relevant specify… 4. After toilet 5. Before cooking 6. Before eating 7. Before breastfeeding 8. After taking children to the toilet 9. After handling animals	 |____| |____| |____| |____| |____| |____| |____| |____| |____|
4.6.1	**If the mother washes her hands, then probe: What do you use to wash your hands?** 1. Only water 2. Soap 3. Soap when I can afford it 4. Ashes	 |____|
4.7	**Where do members of your household relieve themselves?** 1. In the bushes, open defecation 2. Neighbor or shared traditional pit latrine 3. Own traditional pit latrine 4. Neighbors or shared ventilated improved pit latrine 5. Own ventilated improved pit latrine	
4.71	**If latrine used, is it clean (**by observing for example whether feces present on the slab or round latrine)? 1. Yes 2. No 3. Refused the request for observation	|____|
4.72	**How many other household use this latrine?** 1. None 2. shared with _____ number of households	|____|
4.73	**If latrine is used, check on type of slab** 1. Traditional slab with wood or wood covered in clay or other material 2. Cement slab	|____|
4.8	**Does this household have a mosquito net?** 1. Yes 2. No (if No, skip to Question 4.8)	|____|
4.8.1	**If the household owns mosquito net, who slept under the mosquito net last night? (***Probe-enter all responses mentioned* **(Use 1 if "Yes" and 2 if "No")** 1. Children <5 years old 2. Children between 5 and 18 years old. 3. Adult females. 4. Adult males 5. Every body 6. Nobody uses	 |____| |____| |____| |____| |____| |____|
4.8.2	**If the household owns mosquito net (s), when did you last treat it?** 1. Less than one month ago 2. Between one and six months ago 3. More than six months ago 4. Cannot remember	

5. Crop Farming		
5.1	**Did you plant any crops during the most recent planting season?** 1. Yes 2. No (if No, skip to question)	|____|
5.2	**How did you water your crops?** 1. Rain-fed only 2. Irrigated (Riverine/pool etc)	|____|

CROP PRODUCTION CHANGES - CODES

	5.3 How much (in acres) did you plant for each crop type during the most recent planting season?	**5.4 How much did you harvest (during the most recent harvest) in KG?** *Determine appropriate local measure for conversion*	**5.5 How did this compare to the previous harvest** (Same, More, Less)**?**	**5.6 Main cause for change** (see codes below)
A: Maize			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|
B: Sorghum			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|
C: Green Gram			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|
D: Cowpea			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|
E: Pigeon Pea			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|
F: Bean			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|
G: Potato/ Cassava			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|
H: Vegetables			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|
I: Other			Same ☐ More ☐ Less ☐	 Why? |___| Why? |___|

MORE	1. More/Better Rainfall	2. More Seed Available	3. Better Quality Seed	4. Grew Drought Tolerant Varieties	5. More Land Cultivated	6. Access to/increased access to draught power	7. Other
LESS	1. Reduced Rainfall/Poor Distribution	2. Less Seed Available	3. Poor Quality Seed	4. Crops were Not Drought Tolerant Varieties	5. Less Land Cultivated	6. No Draught Power Accessible	7. Other

7. Dietary Diversity, Food Sources and Coping Strategies

7.1 **Did the household eat the following yesterday during the day or night?**
(*WRITE a 1 beside the food if someone consumed it and 2 if no one did***)**

1. Any "*ugali"*, pasta, rice, bread, or any food made from maize, sorghum, millet, wheat? |____|
2. Any potatoes, yams, beets or other foods from roots or tubers? |____|
3. Any vegetables? |____|
4. Any fruits? |____|
5. Any eggs? |____|
6. Any meats (camel, cattle, chicken, poultry/fowl, sheep, lamb, and organ meats (heart, liver, kidney, etc)? |____|
7. Any fish or dried fish? |____|
8. Any foods made from beans, peas, lentils, or nuts? |____|
9. Any milk, yogurt, cheese, or other milk product? |____|
10. Any foods made with oil, fat, ghee, or butter? |____|
11. Any sugar or honey? |____|
12. Any other condiments (coffee, pilipili, tea)? |____|

7.2 **What have been the sources of food for your household in the last 30 days? What percentage of the total came from each source?**
(use proportional piling to determine the percentages)

1. Own farm production (crops, vegetable, fruit) _____
2. Own livestock production (livestock products – e.g. milk, eggs) _____ |____|
3. Own livestock production (meat) _____ |____|
4. Purchase _____ |____|
5. Credit _____ |____|
6. Food aid _____ |____|
7. Gift _____
8. Other (specify) _____

7.3 **In the last 30 days have any household members done any one of the following?**
(Use the codes: 0= Never, 1= Rarely, 2= Frequently, 3= Always)

1. Skip meals (excluding Ramadan) |____|
2. Reduce the size of meals |____|
3. Eat less preferred foods (e.g. wild foods etc.) |____|
4. Borrow (food/money to purchase food) from relatives |____|
5. Restrict adult food intake to allow children to eat |____|
6. Send children to eat with relatives |____|
7. Other (specify) |____|

6. Livestock Ownership

6.1 **Does the household currently own livestock (not including chickens)?**
1. Yes
2. No (if no, skip to question 7.1)

6.2 **How many livestock of each type does your household own?**
a. Cattle
b. Goats
c. Sheep
d. Donkey
e. Chicken

6.3 **What is the average distance you/other HH members have had to travel to access pasture and/or forage and water for your livestock during the last 30 days (in km)?** *(An average of the daily distance covered)*
1. Pasture
2. Forage
3. Water

5.7 **How many months did/will your most recent harvest last for household consumption?** |____|

5.8 **How did you use your most recent harvest?** *(Use proportional piling to get percentages)*
A. Household consumption
B. Sold
C. Gift to relatives or friends
D. Spoilt/unable to maintain beyond certain period
E. Other

8. Household Income & Expenditure

8.1	**Please list all of the sources of income for your household in the last 30 days. What percentage of your income came from each source?** *(Use proportional piling to calculate the percentages)* 1. Agricultural / Horticulture products sale 2. Livestock sales 3. Livestock products sales (milk, eggs, honey, hide, skin etc) 4. Small business (shop) *5.* Petty trade *(on adhoc basis)* 6. Bush products sales (charcoal, firewood, etc.) 7. Alcohol sales 8. Food aid sales 9. Unskilled wage labour 10. Skilled wage labour 11. Remittances from family/relatives 12. Salary 13. Loans/credit 14. Barter/exchange 15. Other (Specify)_____	|_____| |_____| |_____| |_____| |_____| |_____| |_____| |_____| |_____| |_____| |_____| |_____| |_____| |_____| |_____|

8.2 What has the household spent on the following (only if bought with cash or on credit/bartered) IN THE LAST 30 DAYS	**Percentage of expenditure on each item/type (use proportional piling to calculate percentages)**	**8.3 How Item was Purchased (MAIN)** (1=Cash; 2=Credit; 3=Bartered item; 4=Other; 0=not purchased)
Cereals (Maize, rice etc)		
Vegetables & fruit		
Pulses (beans and peas)		
Meat, Fish, Egg		
Cooking oil, fats		
Milk & milk products		
Sugar		
Salt		
Coffee/Tea		
Water		
Medical expenses		
Rent (house or land)		
School fees/expenses		
Transportation		
Fuel		
HH items & clothing		
Alcohol		
Agricultural inputs		
Livestock medication		
Debt repayments		
Other (specify)		

9. SHOCKS AND DISASTER RISK REDUCTION						
9.1	**In the last 3 months, has the household been negatively affected by any shocks? (circle response)**	1	**Yes**	2	**No**

9.2	If yes, please rank the top three in order of importance. Write *1=highest, 2=second highest, 3=third highest (If there were less than three, just rank the highest, second highest etc)*							
	|__|	**A.** Reduced water availability	|__|	**B.** Reduction of pasture/ forage availability	|__|	**C.** Unusually high level of livestock death	|__|	**D.** Unusually high level of livestock diseases
	|__|	**E.** Low level of livestock birth	|__|	**F.** Unusually high prices for food	|__|	**G**. Unusually low prices for livestock	|__|	**H.** Unusually high level of human disease/illness
	|__|	**I.** Reduced income	|__|	**J.** Reduced /No access to credit	|__|	**K.** Reduced casual/wage earning opportunities	|__|	**L.** Crop failure
	|__|	**M.** Unusually low crop sale prices	|__|	**N.** Unusually high level of crop disease/ infestation	|__|	**O.** Unusually high levels of post harvest loss (incl. aflatoxin)	|__|	**P**. Other

For the 2 first main shocks above, please complete the following table using the codes. Please be consistent in the ranking, starting with the letter listed above for the rank 1, than rank 2

Problem **(ranked as above)**	**9.3 Did the Shock create a decrease in your ABILITY to have enough food to eat** 1=Yes 2=No	**9.4 Did the Shock create a decrease in income or a loss of assets?** 1=Yes 2=No	**9.5 What is/did the household MAINLY do to cope with/manage the impact of the shock?** *Use the codes in the table below*	**9.6 Has the household recovered from the impacts of the shock?** 1=Yes 2=No 3 = Partially
1. |___|	|___|	|___|	|___|	|___|
2. |___|	|___|	|___|	|___|	|___|

1. Did not do anything different	2. Reduce amount eaten/eat less	3. Ask support (money or other) from Family/Friends (GIFT)	4. Sold small animals – poultry, goats, sheep	5. Begging
6. Spend less on food	7. Skipped days without eating	8. Ask support (money or other) from Family/Friends (BORROW)	9. Sold large animals – camel, cattle	10. Move to another location
11. Spend less on other non food items	12. Additional HH members migrated	13. Purchase on credit / loan	14. Remove children from school	15. Alternative income source
16. Spend more money than usual on water	17. Spent savings	18. Sold HH articles	19. Rely on food aid	20. Other (describe)

10.8 Market Assessment Data

MARKET PRICE DATA COLLECTION SMART SURVEY; SUMMARY TABLE								
		MAKINDU		KATHONZWENI		KIBWEZI		AVERAGE (KSHS)
Commodity	**Retail Unit**	Vendor 1	Vendor 2	Vendor 4	Vendor 5	Vendor 6	Vendor 7	
ESSENTIAL FOOD ITEMS								
Maize (dry)	1 kg	25	25	28	22	28	28	26.00
Maize (flour)	1 kg	45	50	50	45	40	45	45.83
Rice	1 kg	60	60	80	70	80	65	69.17
Wheat (wheel) flour	1 kg	60	65	65	65	65	60	63.33
Beans	1 kg	70	70	80	75	60	70	70.83
Potatoes	1 kg	50	50	100	70	50	50	61.67
Sugar	1 kg	95	100	100	92	90	85	93.67
Cooking Oil (250 ml)	1 glass	35	35	40	35	38	35	36.33
Cowpeas	1 kg	60	60	60	60	50	60	58.33
Cow Milk (250 ml)	1 glass	10	10	15	10	15	10	11.67
Water	20 liter	5	4	10	10	2	2	5.50
Salt (50 gram)	1 packet	6	6	6	6	6	6	6.00
Tea (100 gram)	1 packet	50	50	50	50	50	50	50.00
MEAT								
Cow	1 kg	260	260	280	260	280	280	270.00
Goat	1 kg	320	320	320	320	340	320	323.33
Chicken	Per head	400	400	500	500	500	600	483.33
LIVESTOCK								
Cattle – Male (3 Yrs Old)	Per Head	8500	8000	8000	8500	5500	10000	8083.33
Cattle – Female (3 Yrs Old)	Per Head	7500	7000	7000	7500	5500	8000	7083.33
Goat – Male (Matured)	Per Head	4000	3500	3500	4500	3500	4400	3900.00
Goat – Female (Matured)	Per Head	3500	3500	2500	3500	3000	4200	3366.67
Sheep – Male (Matured)	Per Head	3000	2500	3000	4000	3500	3000	3166.67
Sheep – Female (Matured)	Per Head	2500	2500	2000	3000	3000	2400	2566.67
VEGETABLE AND FRUITS								
Onion	1 kg	100	100	100	100	90	100	98.33
Tomato	Per Piece	4	4	5	5	5	5	4.67
Avocado	Per Piece	15	10	10	10	20	10	12.50
Green Pepper	Per Piece	1	1	1	1	1	1	1.00
Sukuma Wiki	Per Bundle	10	10	10	10	10	10	10.00
Pawpaw	Per Piece	30	50	40	50	50	40	43.33
Banana	Per Piece	5	5	5	5	5	5	5.00
Mango	Per Piece	20	20	10	15	20	20	17.50
Cabbage	Per Piece	35	40	50	50	30	30	39.17
Sugar Cane	Per Piece	35	30	20	20	25	20	25.00
Spinach	1 kg	10	10	10	10	10	10	10.00
Carrot	Per Piece	4	4	4	4	5	5	4.33

10.9 Plausibility report

Indicator	Survey value	Acceptable value/range	Interpretations/ Comments
Digit preference WEIGHT	6	(0-5 good, 5-10 acceptable, 10-20 poor and > 20 unacceptable)	Acceptable
Digit preference HEIGHT	10		Acceptable
WHZ(Standard Deviation)	0.99	0.8 – 1.2	Acceptable
WHZ (Skew ness)	0.11	If between minus 1 and plus 1, the distribution can be considered as symmetrical.	Symmetrical
WHZ (Kurtosis)	0.02	If less than an absolute value of 1 the distribution can be considered as normal.	Normal distribution
Percent of flags	W HZ: 0.7 %, HAZ: 1.7 %, WAZ: 1.0 %	Less than 3% - 5% of the entire sample	Acceptable range
Sex Ratio	1.0	0.8 – 1.2	Acceptable
General acceptability	4.0 %	0-5= Good; 5- 10= Acceptable	Good
Poison distribution	**GAM:** ID=1.25 (p=0.136) **SAM:** ID=1.00 (p=0.469	If the p value is higher than 0.05 the cases appear to be randomly distributed among the clusters, if p is less than 0.05 the cases are aggregated into certain cluster (there appear to be pockets of cases)	Cases randomly distributed among clusters