Household Food and Nutrition Security Baseline Survey for Dodoma, Iringa, Njombe and Singida

Survey Report

List of Abbreviations

BMI	Body Mass Index
CM	Centimetre
HAZ	Height-for-Age z-score
MAFC	Ministry of Agriculture, Food Security and Cooperatives
MUAC	Mid-Upper Arm Circumference
MVC	Most Vulnerable Children
NGO	Non-Government Organization
SD	Standard Deviation
TAHEA	Tanzania Home Economics Association
TFNC	Tanzania Food and Nutrition Centre
UNICEF	United Nations Children's Fund
WAZ	Weight-for-Age z-score
WFP	World Food Program
WHO	World Health Organisation
WHZ	Weight-for-Height z-score

Acknowledgement

This Food and Nutrition baseline report is the output of the collaboration between Tanzania Home Economics Association (TAHEA Iringa) and Africare through Pamoja Tuwalee MVC Project funded by USAID.

We're certain that these study results will be instrumental in designing appropriate tools and interventions to help the community under the Pamoja Tuwalee Project areas and Tanzania at large.

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1. Kongwa, Kondoa and Dodoma municipal in Dodoma region

2. Iramba, Manyoni and Singida rural in Singida region

3. Makete, Ludewa, Njombe rural and Municipal in Njombe region

4. Kilolo, Iringa rural and municipal in Iringa region

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Executive Summary

Food security exist when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food which meets their dietary needs and food preferences for an active and healthy life. There has been several effort of reducing food insecurity at household level in Tanzania for instance; promoting the cultivation of drought tolerant food crops, introduction of irrigation schemes, food aid, subsidised food for stabilizing food price in the market and provision of drought tolerant seeds. Further in nutrition several projects have been implemented in order to reduce levels of malnutrition, For instance; training health workers and service provider on management of severe acute malnutrition, promotion of exclusive breast feeding for six months and appropriate complementary feeding, management of malnutrition in people leaving with HIV/AIDS, vitamin A supplementation and deworming for children of 6-59 months and promotion the consumption of fortified foods. However despite of efforts foods insecurity and malnutrition levels still high in Tanzania. The objective of this survey was assess food and nutrition status of households school children and children under five years of age in Dodoma, Iringa, Njombe and Singida regions.

The nature of the study was cross-sectional study and multistage random sampling approach was applied, whereby at each stage selection was done by using simple random sampling. Stages of selection were at district level whereby few wards were selected, and then few villages were selected from selected wards and at village level, few households were selected for interview. At household level, all children under five years of age found in households selected were assessed. Primary school children were randomly selected at school level. Therefore this survey had 2259 households, 2181 children under five years of age, 3518 school children and 73 school teachers.

Household food security results showed lower household cereals production in Dodoma and Singida while Iringa and Njombe produced about 500 Metric Tonnes of cereals. Further more than 74% of households in Dodoma and Singida got food through cultivation and buying while majority of households in Njombe and Iringa got food through cultivation (more than 70% of households) as

compared to other source of food. Many household used rooms for food storage (more than 70%) and many stored food using *visarufeti* (more than 75%) in all four regions. Moreover Singida and Dodoma region the prevalence of underweight among women were 16.81% and 16.43% respectively while Njombe and Iringa the prevalence of underweight in women were below 10%.

Food security of primary school children was also assessed. Results shows that 60.63% of children interviewed did not take their breakfast at home. Reasons provided for not eating breakfast at homes were; majority of children were in harry for school numbers (37.55%), there was no food for breakfast at home (25.64%) and other children normally do not eat food in the morning (11.63%). Further nutrition status of these children was assessed based on BMI for age z-scores. Results of BMI for age analysed by sex showed that there was similar prevalence of thin children in both sexes. Further analysis done by age group showed higher prevalence of thin children for age of 15 - 19 years (30%). Analysis done by regions, higher prevalence of thin school children were observed in Singida followed by Dodoma (30.45% and 17.35% respectively). Similar prevalence of overweight was observed across sex, age group and regions.

Assessment of children under five years of age of this survey showed that in general the prevalence of stunting, wasting and underweight were 51%, 4.4% and 17.1% respectively. Further male children had higher prevalence of stunting and underweight as compared to their counterparts (54% and 18.5% for stunting and underweight for male and 48.2% and 15.9% for stunting and underweight for female). Highest prevalence of stunting were observed in Iringa (59%) followed by Njombe (57.8%). Furthermore analysis done by age group showed the highest prevalence stunting was observed in age group of 25 – 36 months (58.3%), while for age group of 6 – 24 months prevalence of stunting, wasting and underweight were 48.6%, 5.9% and 15.3% respectively. Analysis done by children living status showed similar results between MVC and not MVC. However higher prevalence of underweight was observed for MVC as compared to their counterparts. Similar pattern of results was observed for analysis done by regions.

Table of Contents

1. Introduction

1.1 Household Food Security Assessment

Food security exist when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food which meets their dietary needs and food preferences for an active and healthy life (UNCSD Secretariat, 2011). The main source of food in Tanzania is through agricultural production. On average Tanzania produces about 95% of its own food requirements (MAFC, 2006). Apart from the fact that Tanzania has ability to produce large amount of food for its consumption, food production is heavily dependent on rainfall. As a result poor performance of rainfall leads to food shortage and this normally force the government to allow traders to import food. For instance in 2003/04 Tanzania experienced food shortage due to drought as a result the country imported 103,762 Metric Tonnes of maize, 157,597 Metric Tonnes of rice and 437,309 Metric Tonnes of wheat grains (MAFC, 2006).

Major factors affecting food availability, accessibility and utilization are; (1) Low food production (2) Lack of enough labour, (3) Poor agricultural inputs, (4) Incidence of crop and livestock pests and diseases, (5) Lack of food processing technology, (6) Climatic changes, (7) Market infrastructure, (8) Poor transportation infrastructure, (9) Income poverty, (10) Lack of knowledge of balanced diet, (11) Poor diet diversification, (12) Unequal household food distribution and (13) Tradition and customs. Food insecurity in Tanzania widely affects central part of the country (Dodoma and Singida regions), northern part of the country (Manyara, Arusha, Kilimanjaro and Tanga regions), part of coastal regions (Lindi, Mtwara and Pwani) and part of Morogoro, Shinyanga, Mara and Mwanza regions.

Tanzania has several interventions used during food shortage; these can be immediate, medium and long term interventions (MUCHALI, 2012). Immediate interventions include food aid to resource poor households, provision of different types of drought tolerant seed, provision of subsidised foods for stabilizing market price and community sensitization for protecting sources of water. Medium term and long term interventions includes; establishment of irrigation schemes, improvement of

transportation infrastructure, supply of vaccine for livestock diseases, promotion of rainwater harvest, promote diet diversification, train community on proper vegetable storage for future use and promote use of clean and safe water.

TFNC in collaboration with other food and nutrition stakeholders promotes the consumptions of fruits and vegetables. Vegetables are excellent sources of fibres and nutrients and they are naturally cholesterol free. As a result their preparation before cooking, cooking methods and cooking time always matters for someone to benefit the nutrients from them. Some nutrients are normally lost during preparation, for example leafy vegetables washed after being sliced have high chance of leaching out some of nutrients. While other nutrients get lost when exposed to heat, for example when boiling some nutrients leached out into cooking water. However this is not bad if someone had planned to consume water that was used when boiling vegetables (Morgan, 2011) . Further nutrients that lost when exposed to heat also depend with cooking methods and type of vegetables. For example steaming broccoli is better cooking methods for its nutrients than frying or boiling while boiling carrots increases its carotenoid content while steaming and frying reduces it (Havard, 2008).

1.2 Primary school Children Assessment

Food insecurity and poverty at household level also have direct impact to school children nutrition status and their performance. Worldwide school feeding programs are targeted social safety nets that provide both educational and health benefits to the most vulnerable children, thereby increasing enrolment rates, reducing absenteeism and improving food security (World Bank, 2012). In Tanzania there have been several efforts to reduce short and long term hunger among school children in drought prone areas. WFP in collaboration with government of Tanzania through Ministry of Education and Vocational Training supported 350 schools in 13 drought prone districts in Arusha, Manyara, Dodoma and Singida through the program called food-for-education. The project was aimed at improving enrolment, stabilizing school attendance, reducing absenteeism and increasing class concentration.

Presence of malnutrition among school children has impact on learning ability, performance, growth and cognitive development. Children with diminished cognitive abilities and sensory impairments naturally perform less and they are more likely to repeat classes/grades and drop out as compared to normal children (WFP & UNICEF, 2013). Children of school age have increased needs of energy because of rapid growth and increased physical activities. At this age, majority of children suffer from micronutrient deficiencies including Iodine and iron deficiencies. Literature showed that anaemia in school children contributes to reduced physical and mental development, impaired immune function and poor school performance. Other studies proposed the use of micronutrient fortified beverages in primary schools with the target of reducing anaemia and vitamin A deficiency prevalence among school children (Ash, Frongillo, Frongillo Jr, Ndossi, & Latham, 2003).

1.3 Children Under Five Years of Age Assessment

Inadequate nutrients intake in the household has direct impact to nutritional status of children under five years of age and vice versa. Good nutrition is very crucial at this age because children have increased requirement of different nutrients for optimal growth and cognitive development. Poor/under nutrition has several impacts namely; impede cognitive development/intellectual development and poor linear growth. These effects reduce productivity level in adulthood. Further first 1000 days (two years from a first day a mother had conceived) of a child life is an important period for optimal growth and cognitive development. Damages (for instance stunting and ability to learn) resulted from under nutrition at this age are often irreversible. This has resulted into many efforts directed to combat nutritional problems in children during 1000 days in order to prevent lifetime effects of malnutrition.

Tanzania is mainly affected with different forms of malnutrition namely; chronic malnutrition, acute malnutrition, iron deficiency, anaemia, vitamin A deficiency and iodine deficiency disorders. People most vulnerable with these forms of malnutrition are children under five years of age, school children, women of child bearing age, pregnant women and lactating mothers. Current statistics showed that national level of stunting; wasting and underweight were 42%, 5% and 16% respectively

for children under five years of age (National Bureau of Statistics [Tanzania] & ICF Macro, 2011). Stunting prevalence in Sub-Saharan Africa is 40% and this part of Africa is the one with highest prevalence of stunting in the world (UNICEF, 2013). Further according to National Bureau of Statistics [Tanzania] and ICF Macro (2011) prevalence of stunting in Dodoma, Iringa and Singida were 56%, 52% and 39% respectively, while prevalence of wasting was 5.2% for Dodoma, 3.5% for Iringa and 9.2% for Singida.

Low birth weight is one of the indicators of maternal under nutrition. Pregnant mother who are malnourished are more likely to give birth of pre-mature baby and a baby with low birth weight due to intrauterine growth retardation. This increases the risk of death during first seven days of child life (Virtual Medical Centre, 2013). The promotions of good nutrition for first 1000 days of a child, pregnant mothers are targeted with different nutrition interventions in order to prevent them from different forms of malnutrition. Children born with weight below 2.5 kilograms are considered to be born with low birth weight. Currently in Tanzania 7% of weighted children after delivery were born with weight below 2.5 Kilograms (National Bureau of Statistics [Tanzania] & ICF Macro, 2011). The same survey reported 5.2%, 11% and 6.5% of children born with low birth weight in Dodoma, Iringa and Singida respectively.

Infant and young child feeding practices directly affect nutritional status of children under two years of age and ultimately impact child survival (WHO, 2008). The main focus here is children under two year, because this period is very crucial for proper nutritional intervention for child's growth development and health. Colostrum is the pre-milk substance produced from all mammals at birth. This pre-milk supplies immune and growth factors along with a perfect combination of vitamins and minerals to ensure health, vitality and growth of a new born (APS BioGroup, 2012). Colostrum has three major components namely; (1) Immune system factors (2) Growth factors and (3) Nutritional components (Vitamins, Minerals, Amino Acids and Essential Oils). Therefore with all these benefits mothers are encouraged give their babies this pre-milk so that their babies can benefit from it and

continue exclusively breast feeding for six months. In Tanzania the median duration of exclusive breast feeding is 2.4 months (National Bureau of Statistics [Tanzania] & ICF Macro, 2011), which is lower than the WHO recommended time (6 months) for exclusive breast feeding.

Complementary feeding is a process of introducing semi-solid and solid foods to infants as way of providing a child with enough nutrients. Exclusive breast feeding is recommended up to six months, from six months a child should be introduced to complementary foods while continuing breast feeding up to two years and beyond (WHO, 2005). This is because at that time breast milk only is not enough to meet nutritional needs for child growth. Appropriate, adequate and well balanced foods should be provided to a child because wrong complementation provides an opportunity for different forms of malnutrition to a child; for instance chronic malnutrition, acute malnutrition and micronutrients deficiencies. In Tanzania experience showed that at age of 6 months many children starts to be stunted and at age between 22 months and 23 months that when stunting is at the pick (60%) (National Bureau of Statistics [Tanzania] & ICF Macro, 2011).

Vitamin A is an essential micronutrient for the immune system that plays an important role in maintaining the epithelial tissue in the body (National Bureau of Statistics [Tanzania] & ICF Macro, 2011). WHO has identified that Vitamin A deficiency as a leading cause of preventable blindness in children and increased risk of diseases and death from severe infections. Tanzania has national campaign for combating Vitamin A deficiency among children, this national campaign is done twice in a year. The target population of this campaign are children of age 6 – 59 Months. Moreover there has been effort to encourage people to consume locally available foods rich in vitamin A for instance milk, liver, eggs, fish, red palm oil, mangoes, papayas, carrots, pumpkins and green leafy vegetables. National health survey had estimated vitamin A deficiency among children under five years of age was 34% (National Bureau of Statistics [Tanzania] & ICF Macro, 2011).

Vaccine is a biological prepared substance that is used to stimulate the production of antibodies and provide immunity against one or several diseases. Vaccination is a process of taking vaccine as a

precaution against contracting a disease. In Tanzania children receive different types of vaccines namely; BCG, DPT, Polio vaccine and measles vaccines according to vaccine schedule provided by Ministry of Health and Social Welfare.

1.4 Problem Statement

There have been several food and nutrition security activities which aimed at increasing food security at household level and reduce levels of malnutrition. These programs are; cultivating drought tolerant food crops, school feeding programs, twice yearly food and nutrition security assessment, promotion of exclusive breast feeding for six months and appropriate complementary feeding for infants and young children. Other interventions are management of malnutrition in people leaving with HIV/AIDS, training on appropriate methods of storing vegetables, promoting the consumption of high quality cassava flour, vitamin A supplementation and deworming for children of 6-59 months, promoting health eating style for preventing non-communicable diseases and promotion of eating locally micronutrients fortified foods such as fortified wheat flour, maize flour and edible oil.

However despite of the efforts foods insecurity and malnutrition levels are still high in Tanzania. This necessitated the assessment of household food situation and nutritional status of school children, children under five years of age and women in order to come up with appropriate interventions for existing problems in the surveyed area. Therefore this study will help TAHEA which collaborate with AFRICARE to identify existing gaps in surveyed regions and plan appropriate interventions.

1.5 Objectives

General Objective

To Assess food and nutrition status of households and school children in Dodoma, Iringa, Njombe and Singida regions.

Specific Objectives

- To determine food security status of households and school children.

- To assess household food production and food storage practices.

- To assess distribution of responsibilities in the households.

- To assess nutrition status of children under five years of age, school children and women/guardian.

- To assess children care practices including breast and complementary feeding.

- To assess the hygiene issues including availability of toilets, waste disposal and safe and clean water.

2. Material and Methodology

2.1 Material

Data collection was done using questionnaires. These questionnaires were developed by TAHEA together with technical experts from TFNC and COUNSENUTH. Four types of questionnaires were designed to capture information at different level namely: household questionnaire, children under five years of age questionnaire, primary school children questionnaire and school teacher questionnaire. Household questionnaire was designed to collect information on food and nutrition security information at household level, while children under five questionnaires were used to collect information on nutrition and feeding practices for children 6-59 months. School children questionnaire was designed to collect information on food and nutrition situation and availability of school feeding programs, while school teacher questionnaire was designed to collect information on school performance, dropout, availability of school feeding programs and presence of nutrition follow-up programs.

2.1.1   Training of Enumerators

The enumerators were community volunteer who works in Pamoja Tuwalee project in surveyed area. These volunteers had a lot of experience in community work. These volunteers were trained

on how to use designed questionnaires and rights of the respondents on sensitive questions. In addition to this, a research team had one person who was responsible for measuring weight, height and MUAC. This person was trained on how to use length boards, weighing scales and MUAC tapes.

2.1.2   Measurements

Anthropometric measurements were taken from children of age 6-59 months, mother/guardians at household level and primary school children of age 5–19 years. These measurements taken were used to determine nutrition status of children under-fives, mothers/guardians and primary school children. In addition MUAC was also measured for children under five and their mothers/guardians. All measurements taken were adhered to standard procedures for taking anthropometric measurements.

2.2 Methodology

This study was conducted in four regions namely; Dodoma, Iringa, Njombe and Singida. In each region the study covered three districts which implements Pamoja Tuwalee project. The study was conducted in Mufindi, Kilolo and Iringa rural districts for Iringa region; Ludewa, Makete and Njombe rural districts for Njombe region; while in Dodoma region districts included were Kongwa, Dodoma urban and Kondoa; and finally Iramba, Singida rural and Manyoni were districts covered in Singida region. Further in each Pamoja Tuwalee district a list of all available wards was collected. Using random number generator for each district three wards were randomly selected with an exception of Njombe region whereby four wards were selected in one district. Further for all selected wards, two villages were randomly selected. These were villages with primary schools. Finally in each selected village 55 households were randomly selected. All available children under five years of age from each selected household were assessed and head of household was interviewed. In each village one primary school was also assessed using questionnaire which had two parts, first part was for primary school children and the second was for school teacher. In each primary school, 50 children and one head teacher were interviewed.

2.2.1 Study Design

The nature of the study is cross-sectional study. In this study a multistage random sampling approach was applied. At each stage selection was done by using simple random sampling. Stages of selection were at district level whereby in each district 3 wards were selected but in Njombe 4 wards were selected in one of the three districts, and then at ward level 2 villages were selected. Finally at village level, 55 households were selected for interview. For primary school children, 50 school children were randomly selected at school level. The advantage of using this sampling procedure is that one does not need to have complete list of the population of all places but only those which will be surveyed after levels of selection has been identified. Further in household selection at village level, it was done under the assumption that each household has at least 1 child who is under five. Therefore in total 4070 households were expected to be interviewed in the study. These households were obtained using the following formula; $n_1 = w * [(z * y) + x]$, where n_1 = total number of households, w = 55 households per village, z = number of villages (6) multiply by 3 wards per district, y = regions (this includes Dodoma, Iringa and Singida), and x = villages in Njombe region (this is because in Njombe one district had 4 wards). However due to time limitation and resource constrain 2259 households were interviewed.

In each village one primary school was assessed. Therefore in total, 18 primary schools were interviewed at regional level except for Njombe which had 20 primary schools assessed. In each primary school 50 children were randomly selected to represent the entire school. A total sample of 3,700 school children were selected in all four regions. These total school children were obtained using the following formula; $n_2 = a * [(b * y) + g]$ whereby n_2 = total sample of school children, a = 50 school children selected in each primary school, b = primary schools per region (18) except Njombe and g = 20 primary schools in Njombe. Finally a total of 74 school head teacher were also expected to be interviewed. These were obtained by using the following formula; $n_3 = [(b * y) + g]$, whereby n_3 = total number of primary schools. However due to data cleaning process 3513 school children in 73 primary schools were eligible for data analysis.

Data entry was done in SPSS version 20, WHO Anthro and WHO AnthroPlus. While data management and analysis was done by using SPSS version 20, SAS version 9.2 software and graphs were plotted using R version 2.15.2 software and excel 2010.

3. Results

3.1 Households Food Security Assessment

3.1.1 Household Characteristics

Before discussing household food security lets discuss characteristics of households assessed. This survey covered a total of 2259 households, whereby in Dodoma there were 499 households, Iringa there were 553 households, Njombe there were 631 households and in Singida there were 576 households. Heads of the household had an average of 37 years, the youngest head of household was 16 years and oldest head of household was 86 years. The survey shows that 65.93% of head of household were male and the rest were female heads. Households had an average size of 4 members in all four regions, with minimum size of 1 members and maximum size of about 11 members, except Singida whereby the maximum household size was 14 members. Further results of the survey shows 78% household heads were not guardian for MVC while 23% were guardian for MVC.

Table 1 below summarises some characteristics of heads of households by regions. Results shows majority were married with single wife in all four regions, while few were single, divorced and widowed. Iringa, Njombe and Dodoma show relatively larger proportion of polygamy (above 8%) as compared with Singida (5.52%). Many heads of households had primary school education level (above 66%) whereas very few head of household attained higher education level (about 1%) in all four regions.

Table 1: Percent distribution of baseline characteristics of head of household by regions

Region	Marrital Status					Education					
	Married (Single Wife)	Married (Polygamy)	Single	Divorced	Widow	No education	Adult education	Not completed Primary School	Primary School	Secondary School	Higher Education
Dodoma	74.25	8.05	6.24	5.43	6.04	20.88	0.6	4.22	66.87	6.63	0.8
Iringa	68.35	10.11	9.55	2.43	9.55	6.87	1.27	2.53	81.74	6.15	1.45
Njombe	74.44	8.15	6.71	4.95	5.75	5.07	0.63	2.22	86.37	5.39	0.32
Singida	74.38	5.69	5.52	8.01	6.41	7.53	0.7	3.68	84.24	3.15	0.7

Further Figure 1 summarises occupation of heads of households. Results shows across all regions majority of heads were farmers (above 77%), few were employed (below 8%) and very few were engaged in large scale business in Dodoma and Singida (about 1%).

Figure 1: Percent distribution of occupation of head of households by regions

3.1.2   Household Food Availability

Food availability was assessed based on level of food production and other sources of food at household level. Many households reported their food production in terms of sacks for cereals and tin for legumes. In order to report in Metric Tonnes responses in tin were converted into kilograms and then converted into Metric Tonnes and response in sacks were converted in to kilograms and then converted into Metric Tonnes. One tin of legumes was equivalent to 18 kilograms, one sack of cereals was equivalent to 100 kilograms and one Metric Ton was equivalent to 1000 kilograms.

Results in Table 2 shows that households in Dodoma and Singida produced less cereal (142.13 Metric Tonnes and 242.2 Metric Tonnes respectively) as compared to households in Iringa and Njombe (474 Metric Tonnes and 428 Metric Tonnes respectively) in one season. Similar results were observed for legumes production in Iringa and Singida in one season (28.10 and 21.36 Metric Tonnes respectively) while smallest level of legume production was observed in Dodoma (4 Metric Tonnes). Results shows less producing regions bought many Tonnes of cereals (49.43 Tonnes for Dodoma and 58.13 Tonnes for Singida) as compared to regions which produced more cereals. In general small amount of legumes were bought in all four regions, less than 1 Metric Ton was bought in Iringa and Njombe while about 3 Metric Tonnes were bought in Dodoma and Singida.

Table 2: Total amount of household food production and food bought in one season for all four regions (Measurements in Metric Tonnes)

Regions	Food Produced		Food Bought	
	Cereals	Legumes	Cereals	Legumes
Dodoma	142.13	4.59	49.43	3.76
Iringa	474.80	28.10	2.18	0.36
Njombe	428.80	40.27	2.79	0.50
Singida	242.20	21.36	58.13	2.59

The survey also assessed sources of households foods; results in Table 3 shows that Njombe and Iringa had larger proportion of households obtained foods through cultivation (79.52% and 70.75% respectively) while Dodoma and Singida had small proportion of households obtained food through cultivation (10.51% and 17.04% respectively). About 74% of households in Dodoma and Singida were buying and cultivating foods. However among households that bought food larger proportion of households in Dodoma and Singida could not afford the cost (78% and 69%) and Iringa and Njombe 55% and 46% of households respectively could not afford food cost ether. The same table shows few households in Iringa obtained food through food aid and few households in Iringa and Njombe obtained food through cultivation and food aid. Furthermore 0.35% of households in Singida and 4.6% of households in Njombe exchanged food as a way of getting foods of their preference.

Table 3: Percent distribution of different sources of household foods by regions

| Region | Food Availability | | | | | | |
	Buying	Cultivating	Food Aid	Food Exchange	Buying and Cultivating	Buying, Cultivating and Food Aid	Cultivating and Food Aid
Dodoma	15.76	10.51	0	0	73.74	0	0
Iringa	6.58	70.75	0.18	0	22.3	0	0.18
Njombe	1.27	79.52	0	4.6	14.29	0	0.32
Singida	8.17	17.04	0	0.35	74.26	0.17	0
Overall	7.52	46.19	0.04	1.38	44.68	0.04	0.13

3.1.3   Household Food Storage Practices

Results of this survey (Table 4) shows that majority of households (above 70%) in all four regions were storing their foods in rooms at home. 28.14% of households in Iringa and 16.37% of households in Njombe stored food in *Kihenge*, few households stored their foods in both rooms and *Kihenge* (below 1%), while other households stored foods in sacks. Condition of storage facilities were further assessed to see if they were suitable for storing food for future use. Analysis shows that about 51% of storage places had windows for ventilation and 29.23% of storages had floor. Few of these storage places had both floor and windows (7.55%). Moreover results for food storage time showed that about 81% of households in Iringa and 79% of households in Njombe stored food for six months and above, while in Dodoma 28.54% of households stored food for 2 - 4 months and Singida; 32.61% of households stored food for 4 - 6 months. The amount of food stored was crucial to understand, Iringa, Njombe and Singida; households surveyed stored more than 200 Metric Tonnes of cereals while Dodoma stored 184.3 Metric Tonnes. In addition Iringa and Njombe region stored many Tonnes of Legumes (more than 20 Metric Tonnes) as compared to Dodoma and Singida.

Table 4: Percent distribution of food storage places, storage equipment and amount of food stored in Metric Tonnes

| Region | Places for Food Storage | | | | Storage Equipment | | | | | Foods Stored | |
	Kihenge	Room	Sacks	Kihenge and Room	Sacks	Visarufeti	Plastic Bags	Plastic Bucket	On the Floor	Cereals	Legumes
Dodoma	0.43	99.57	0	0	1.27	97.21	0.25	1.27	0	184.30	3.87
Iringa	28.14	71.48	0.19	0.19	16.1	78.67	1.01	1.61	2.62	296.70	20.90
Njombe	16.37	82.99	0.48	0.16	6.42	91.38	1.28	0.18	0.73	264.40	25.02
Singida	3.28	95.76	0.58	0.39	6.61	87.55	5.25	0.39	0.19	219.60	13.49

3.1.4 Household Vegetable Preparation and Storage

Results for vegetable preparation and cooking methods were summarised in Table 5. This table shows that 98% of households in Iringa, 99% households in Njombe and 65% of households in Singida washed their vegetables before slicing, while 45% of households in Dodoma washed their vegetables after slicing. In all four regions it was observed that more than 35% of households were cooking their vegetables by boiling and while other households used both boiling and frying cooking methods. Very few households in Dodoma (0.4%) and Njombe (0.32%) cooked vegetables using steam while surveyed households in Iringa and Singida did not use this cooking method. Cooking time is very important for vegetables in order preserve nutrients. Unfortunately many surveyed households were cooking their vegetables for than 5 minutes; for instance 65.19% of households in Dodoma and 61.67% households in Singida cooked vegetables for more than 5 minutes.

Furthermore vegetable colour after cooking is crucial for assessing whether vegetables are overcooked or not. The over cooked vegetables its colour normally changes from green to colour different from green. The analysis of this survey shows 74% of households in Dodoma and 57% of households in Singida their vegetable changed from green to other colour after cooking, while 54% of households in Iringa and 62% of households in Njombe their vegetables were green after cooking. Over 95% of households in Dodoma, Iringa and Njombe covered their vegetables when they are cooking but Singida 6.33% of households were not covering all types of vegetables while cooking.

Table 5: Percent distribution of ways of vegetable preparation, vegetable cooking methods and time for cooking by regions

Region	Vegetable		Vegetables Cooking Methods				Time for Cooking Vegetables		
	Washing before Slicing	Washing after Slicing	Boiling	Frying	Cooking with Steam	Boiling and Frying	Less than 5 Minutes	5 Minutes	More than 5 Minutes
Dodoma	54.93	45.07	47.69	10.66	0.4	41.25	16.9	17.91	65.19
Iringa	98	2	41.89	21.31	0	36.79	33.39	19.96	46.64
Njombe	98.57	1.43	37.36	16.53	0.32	45.79	34.92	20.48	44.6
Singida	65.38	34.62	42.86	27.18	0	29.97	11.15	27.18	61.67

3.1.5   Household Food Consumption

Results of this survey (Table 6) shows in all four regions more than 50% of household consumed maize. 15.5 % of households in Dodoma and 25.14% of households in Singida consumed sorghum while 21.73% of households in Iringa consumed rice and 16.72% of households in Njombe consumed wheat. There were different types of vegetables that were available in all four regions. The same table shows many households in Dodoma consumed pulses leaves (24.09%) and 21.21% of households consumed amaranth leaves. Majority of households in Iringa and Njombe consumed pumpkin leaves and amaranth leaves (27.26% and 21.59% respectively for Iringa and 29.62% and 19.62% respectively for Njombe). In Singida many households consumed *mlenda* and amaranth leaves (24.04% and 26.64% respectively).

Further households consumed varieties of fruits depending on what is available in their villages. Many households in Singida (37.38%), Dodoma (36.24%) and Iringa (21.16%) consumed mangoes. About 30% and 22% households in Njombe and Iringa respectively consumed avocados. Finally 27.9% of households in Dodoma, 21.5% households in Njombe and 18.57% of households in Singida consumed ripped bananas. Many households consumed beans (above 45%) in all four regions. Other types of legumes consumed were pulses in Dodoma (38.1% of household) and Singida (35.25% of households). This study also depicted that there were households consuming peas in Iringa, Njombe and Singida (23%, 28% and 1% respectively) except for Dodoma region. For the case of meat, milk and fish; majority of households (above 20%) in all four regions consumed beef and chicken meat while small proportion of households consumed fish Dodoma and Singida (4.64% and 9.28% respectively).

Table 6: Percent of households consumed various types of foods by regions

Types of foods consumed in the household	Region			
	Dodoma	Iringa	Njombe	Singida
Cereals				
Maize	58.93	63.79	67.09	51.90
Sorghum	15.50	5.14	1.28	25.14
Millet	9.59	0.00	0.00	14.38
Rice	15.98	21.73	9.27	8.57
Wheat	0.00	4.32	16.72	0.00
Finger Millet	0.00	5.02	5.64	0.00
Vegetables				
Pulses leaves	24.09	4.81	1.23	7.90
Pumpkins leaves	0.00	27.26	29.62	10.88
Mlenda	19.32	2.62	1.72	24.04
Spinach	0.00	2.67	4.48	2.76
Amaranth leaves	21.21	21.59	19.62	26.64
Chiniz	8.16	10.64	17.59	6.23
Sweet potatoes leaves	16.25	10.26	3.89	11.86
Cassava leaves	10.97	1.60	3.89	9.04
Okra	0.00	0.21	0.00	0.65
Kale	0.00	18.33	17.94	0.00
Fruits				
Papaya	12.94	6.74	2.61	6.92
Guava	10.74	10.62	9.48	15.86
Oranges	12.18	18.74	15.69	10.72
Ripped Bananas	27.90	19.26	21.50	18.57
Syzygium Cumini	0.00	1.04	0.59	10.55
Mangoes	36.24	21.16	19.67	37.38
Avocado	0.00	22.45	30.46	0.00
Legumes				
Pulses	38.10	20.95	12.31	35.25
Beans	45.94	50.33	54.51	48.07
Pigeon Peas	10.35	1.80	2.83	2.83
Bambara Nut	0.00	2.09	1.73	4.43
Peas	0.00	22.56	28.08	1.13
Green Gram	5.61	2.27	0.55	6.03
Lentils	0.00	0.00	0.00	2.26
Meat, milk and fish				
Beef	37.02	24.50	25.76	32.08
Milk	16.32	12.38	5.68	12.89
Goat meat	14.36	3.39	3.04	12.19
Fish	4.64	15.77	13.59	9.28
Eggs	4.37	12.90	16.23	9.51
Chicken Meat	19.00	15.05	20.08	17.61
Pock	4.28	6.71	6.22	1.34
Lamb	0.00	0.07	0.14	1.02
Sardins	0.00	9.25	9.26	4.09

3.1.6 Nutrition Status of Women

Nutrition status of women was assessed based on BMI which assess weight-for-height in adult. This indicator measure thinness or obesity and low pre-pregnancy BMI is normally associated with poor birth outcomes. BMI is estimated using the following formula; $BMI = Weight(Kg) / Height(M^2)$. After estimating BMI, it was classified into four categories based on WHO BMI classification (WHO, 2006). A woman with BMI less than 18.5 was classified as underweight, a woman with BMI greater or equal 18.5 and BMI less or equal 24.99 was classified normal weight, a woman with BMI greater or equal 25.0 and BMI less or equal 29.99 was classified overweight and finally a woman with BMI greater or equal 30 was classified obese.

Overall analysis of nutrition status of women shows that 12% of women were underweight, 65% were normal, 16.64% were overweight and 6.33% were obese. Analysis by region (Figure2) showed in all four regions majority of women were normal. However in Singida and Dodoma region the prevalence of underweight were 16.81% and 16.43% respectively while Njombe and Iringa the prevalence of underweight was below 10%. On the other hand Iringa region had larger proportion of overweight (22.06%) followed by Dodoma (16.23%), whereas Njombe and Singida showed similar proportion of overweight (about 14%). Obese was below 5% for Njombe and Singida while Dodoma had larger proportion of obese women (10.62%) as compared to other regions.

Figure 2: Percent distribution of women for BMI categories by regions

MUAC measurements of women in the surveyed households were also analysed. MUAC is proxy indicator of weight-for-height in women. These measurements were classified as follows; a woman with MUAC below 21 cm was classified severe acute malnutrition, a woman with MUAC greater or equal to 21 cm and MUAC less or equal to 22.99 cm was classified moderate acute malnutrition and a woman with MUAC greater or equal to 23 cm was classified normal. Results in Figure 3 shows that 12.02% of women in Dodoma and 6.66% of women in Njombe had severe acute malnutrition. Further 12.02% of women in Dodoma, 11.09% of women in Singida and 9.4% of women in Iringa were classified moderate acute malnutrition. Finally the prevalence of global acute malnutrition was 24.04% in Dodoma, 12.65% in Iringa, 14.43% in Njombe and 15.42% in Singida.

Figure 3: Percent distribution of MUAC categories of women by regions

3.1.7 Women Workload

Women workload was assessed based on distribution of responsibilities at household level. Results in Table 7 shows that in all four regions women were mostly responsible for cooking, washing clothes and fetching water. In Njombe region there were no fathers who participated in cooking, washing clothes and fetching water.

Table 7: Percent distribution of household responsibilities among household members by region

Region	Responsible Person for Cooking			Responsible Person Washing Clothes			Responsible Person Fetching Water		
	Mother	Mother and Female Children	Father	Mother	Mother and Female Children	Father	Mother	Mother and Female Children	Father
Dodoma	73.12	3.26	20.77	73.73	3.46	16.9	69.55	5.56	20.58
Iringa	86.21	2.18	7.08	85.82	7.27	2	78.15	5.08	10.73
Njombe	88.27	0	0	87	0	0	79.59	0	0
Singida	88.31	8.2	0.52	88.64	7.69	0	72.58	16.7	1.93

Other household responsibilities were summarised in Figure 4, this results also shows that large proportion of women (above 60%) were responsible for collecting firewood, taking care of invalids and taking children to clinic in all four regions. In Iringa and Njombe results shows that fathers were not participating in collection of firewood and taking care of sick people in the households. Few fathers in Dodoma (4.02%), Iringa (4.54%) and Singida (0.18) helped their wives taking children to clinics.

Responsibility of collecting firewood by region

Responsibility of taking care invalids by region

Responsibility of taking children to clinic by region

Figure 4: Percent distribution of different responsibilities among household members by regions

3.1.8   Household Hygiene and Water Sources

Household hygiene and availability of clean and safe water contributes to good nutritional status and better health of household members. Table 8 below shows majority of households in Iringa and Singida got water from wells (around 44%) while many households in Dodoma and Njombe used tape water (about 63%). Few households used spring water except Singida region and very few households used water from both rivers and wells in Iringa, Njombe and Singida. However above 60% of households in all four regions used water that was not clean and safe. In Dodoma and Singida

there were larger proportions of households using water that was not clean and safe (74.8% and 70.98% respectively).

Table 8: Percent distribution of source of water and availability of clean and safe water by regions

Regions	Source of Water						Clean and Safe water	
	River	Wells	Tape water	Spring	River and Well	River, Wells and Tape Water	Yes	No
Dodoma	8.23	27.16	63.37	1.23	0	0	25.2	74.8
Iringa	12.27	44.32	37.55	2.38	1.28	2.2	36.23	63.77
Njombe	5.42	24.88	62.36	1.75	2.71	2.87	35.77	64.23
Singida	13.01	44.82	30.05	0	5.62	6.5	29.02	70.98

Availability and appropriate use of toilets and rubbish pits are among determinants of good nutritional status and better health of households. In this survey availability of toilets and rubbish pits at household level were assessed. Results summarised in Table 9 shows that many households in Singida and Dodoma had no good toilets (85.69% and 76.28% respectively). Findings also depicted that the same region had larger proportion of households with no rubbish pits in their compounds (70.37% of households in Dodoma and 64.62% of households in Singida).

Table 9: Percent distribution of availability of good toilets and rubbish pit in households by regions

Region	Availability of Good Toilets		Availability of Rubbish Pit	
	Yes	No	Yes	No
Dodoma	23.72	76.28	29.63	70.37
Iringa	34.6	65.4	44.46	55.54
Njombe	28.78	71.22	42.2	57.8
Singida	14.31	85.69	35.38	64.62

3.2 Primary School Children Assessment

In total there were 3513 children assessed (1838 female and 1675 male) from 73 primary schools. The mean age of children assessed was 11.2 years with standard deviation of 2.29 years, with minimum age of 5 years and the maximum age of 19 years. In all children assessed, 38.26% were MVC and 56.99% were non MVC and 4.75% children did not state their status. Moreover this study

deduced that on average children spend 25.11 minutes to reach their schools and analysis done by region shows similar average time used to reach schools in all four regions.

3.2.1 Food Security of Primary School Children

Results shows that 60.63% of children interviewed did not take their breakfast at home. Reasons provided were; being in harry for school numbers (37.55%), no food for breakfast at home (25.64%) and habit of not eating in the morning (11.63%). Other reasons were; parent do not cook in the morning, some children were eating at home after school hours, parent got other responsibilities in the morning like agriculture, some were eating at school and others were experiencing stomach-ache when they eat early in the morning.

For those who ate their breakfast at home, majority drink tea with snacks or leftovers (rice, sweet potatoes, *Kande* and bananas) (40.67%), others ate left overs alone (20.12%), some ate stiff porridge/rice with beans or leafy vegetables (19.97%) and others were drinking porridge only (8.93%). Other foods used for breakfast were plain tea, potatoes, maize, bananas and *Togwa.* This study found that 93% school children do not carry food to school, among those who carried food to school, foods carried were slices of bread, sweet potatoes, bananas, *maandazi* and maize.

Further presence of school garden was also assessed; results in Table 10 shows there was no school garden for vegetables in many schools in all four regions. Schools that had vegetable garden were Bomalang'ombe and Ilamba in Iringa, Farkwa in Dodoma, Iyembela and Lilombwi in Njombe, Kijota and Siuyu in Singida. Despite of these schools having gardens for vegetable, majority of children did not eat vegetables in their school meals. Reasons for not eating vegetables were; (1) vegetables were used by school teachers, (2) schools were selling them, (3) children were drinking porridge only and (4) in some schools there was no school feeding program.

Table 10: Percent distribution for presence of school garden and use of vegetables in school meals by regions

Region	Presence School garden for vegetables		Use of vegetables in school meals	
	Yes	No	Yes	No
Dodoma	6.07	93.93	0	100
Iringa	11.91	88.09	0	100
Njombe	9.99	90.01	49.49	50.51
Singida	11.01	88.99	37.76	62.24

3.2.2 Nutrition Status of Primary School Children

Being assessed food security; nutrition status for school children was also assessed based on BMI for age z-score (Onis, et al., 2007). The obtained BMI for age z-score was classified as follows; normal children had BMI for age z-score of range $-2 \leq z - score \leq 1$, thin children had BMI for age z-score below -2 and overweight children had BMI for age z-score above 1 (WHO, 2013).

In general it was observed that 83.46% of all children were normal while 14.77% of all children were thin and only 1.76% of all children were overweight. BMI for Age categories were analysed by sex, Table 11 shows that there was similar prevalence of thin children in both sexes. Analysis done by age group shows higher prevalence of thin children in age group of 15 - 19 years (30%) followed by age of 10 – 14 years (17.61%). Majority of children with age of 5 – 9 years had normal BMI for age z-scores (92.29%). Further analysis done by student living status; results showed that children who were MVC had higher prevalence of thinness (15.18%) as compared to children who were non MVC (13.69%). Analysis done by regions indicated higher prevalence of thinness in Singida followed by Dodoma (30.45% and 17.35% respectively). Many school children in Njombe and Iringa had normal BMI for age z-scores (93.65% and 90.17% respectively). Similar proportion of overweight was observed across sex, age group, student living status and regions.

Table 11: Percentage distribution for BMI z-scores categories by sex, age group, status and regions

Variable	BMI for age categories		
	Normal	Thin	Overweight
Sex			
Female	83.95	14.42	1.63
Male	82.93	15.16	1.91
Age group in years			
5 - 9	92.29	4.76	2.95
10 - 14	81	17.61	1.39
15 - 19	69.09	30	0.91
Student Living Status			
MVC	83.78	15.18	1.04
Non MVC	83.92	13.69	2.4
Regions			
Dodoma	80.42	17.35	2.23
Iringa	90.17	8.01	1.82
Njombe	93.65	4.23	2.12
Singida	68.65	30.45	0.9

Nutrition status by primary schools children were assessed in all four regions. In Dodoma (Plot 1) the following schools had high prevalence of thin children; Dalai was 38.38%, Mirambo was 38%, Farkwa was 32.65%, Gonga was 29.17%, Gomai was 27.08%, Tandala was 20%, Mahomanyika was 18.75% and Nzuguni was 12.24%. Overweight was observed in few schools; 12% for Nkuhungu, 8.57% for Vilundilo, 6.12% for Chadulu and 4.08% for Kizota.

Plot 1: BMI Z-score categories by schools in Dodoma

Iringa; schools (Plot 2) with high prevalence of thin children were Kibada (18.75%), Kinywang'anga (16%), Kilolo B (14.89%), Mwatasi (10%), 8% for Maduma, Magulilwa and Nudwe. On the other hand Mwatasi, Luhindo, Ndiwili and Magulilwa schools had similar proportion of overweight among school children (4.35%, 4.08%, 4.08% and 4% respectively).

Njombe region (Plot 3) prevalence of thin children was between 5% and 20%. The following school shows prevalence of thin children of within the above mentioned interval; 12.24% for Luana, 10.2% for Manda, 8% for Muungano and Mbwila and 6.12% for Ushindi, whereas small proportion of overweight children was observed in Kiumba (6%), Mang'oto (4.26%) and 4.08% for Mbwila and Ikete.

Plot 3: BMI Z-score categories by schools in Njombe

Singida (Plot 4) majority of schools shows very high prevalence of thinness among children, some were even above 50%. The following schools had higher prevalence of thin children; Siuyu (68%), Ntanduu (60%), Kinyeto (58%), Unyankhanya (54%), Kijota (44.9%) and Idang'adu (36%). Schools with prevalence of thin children between 20% - 30% ware Mwanzi, Igonia, Makalama, Mwanga, Mpandagani, Singa and Nkungi. On the other hands small proportion of overweight was observed in few schools namely; Manyoni and Gurungu (6%) and Kitopeni and Nkalakala (2%).

Plot 4: BMI Z-score categories by schools in Singida

3.2.3   School Teacher Assessment

In this survey class teacher were interviewed for availability of school feeding program, school dropout, school attendance and class performance. Dodoma schools had an average of 878 children, Iringa had an average of 452 school children, Njombe had an average of 376 school children and Singida had an average of 650 school children. Dodoma region the following schools were providing school meal; Farkwa, Gonga, Manungu, Ngomai, Nkuhungu and Vilundilo. In some these schools this program was seasonal while other the program was permanent. Foods provided in schools were from parent contribution (66.7%) and WFP food aid (33.3%). Porridge, stiff porridge, *kande* and vegetables were the main foods provided in schools and many schools were providing one meal per day (66.6%).

Majority of schools in Iringa had school feeding program except Bomalang'ombe, Itamba, Kibada, Nundwe and Vikula. Among schools that provided meals, 91.67% of the programs were permanent and the main source of food was parent contribution (83.33%). Other schools had two sources; parent contribution and school farms (16.67%). Majority of schools were providing porridge (83.33%), other were providing porridge and *Kande* and stiff porridge with vegetables. All schools assessed in this region were providing one meal per day.

Njombe also shows majority of school were providing meals. However Igalu, Mafiga, Maliwa, Misiwa and Usetule had no school feeding program. 60% of school feeding programs were seasonal, while other feeding programs were permanent. Many schools got food from parent contribution (66.67%) whereas the rest obtained food from both parent contribution and school farm. Many schools were providing *Kande* (64.29%), while others were providing stiff porridge with vegetables, porridge, porridge and *Kande* and porridge with sweet potatoes. All schools assessed were providing one meal per day.

Idang'adu, Kijota, Mwanga, Nkalakala, Nkungi and Singa primary schools did not have school feeding program. About 92% of schools had permanent school feeding program while the rest were

seasonal. Among those which had school feeding program; 92.31% of schools got food from were from WFP food aid and the remaining was from parent contribution. Majority of schools with school feeding programs (about 60%) were proving three types of foods namely porridge, stiff porridge and *kande*. The rest were providing single food; that was either porridge, *kande* or stiff porridge and about 60% of schools with school feeding program were providing two meals per day.

In general, nutrition follow-up was done twice in a year for majority of schools with nutrition follow-up. Regions which had many schools doing nutrition follow-up twice a year were Dodoma (53.33% of schools), Iringa (64.71% of schools) and Njombe (75% of schools), while Singida region majority of schools were doing nutrition follow-up once in a year (60% of schools).

3.2.4 School Performance, Attendance, Dropout and Pupils in Difficult Circumstances

School performance was assessed based on standard 7 examination results. Teachers classified school performance into four categories namely; bad, average, good and excellent. In Dodoma 58.82% of surveyed schools had good performance followed by average performance (35.29%) and remaining schools had bad performance. For Iringa and Singida schools about 50% of all schools had good performance, about 20% of school had average performance and about 11% school had bad performance. Further both regions Iringa and Singida few primary schools (about 11% of all school) had excellent performance. Schools in Njombe region had poor response on this aspect as a result only one school out of 20 schools reported good performance of standard 7 results.

Table 12 summarises school attendance, dropout and pupils in difficult circumstances. School attendance was assessed based on percentage of attendance, teacher were providing percentage of school attendance yearly. Results in Table 12 shows all four regions had an average school attendance above 80%. Dodoma had an average school attendance of 80%, Iringa had an average of 90%, Njombe had an average of 92% and Singida had an average of 86%.

Average number of pupils dropout before completing primary schools in a year were also summarised in Table 12. Result shows that Njombe on average had many school dropouts (23 pupils) followed by Dodoma and Iringa (about 18 pupils). Singida on average had few dropouts (8 pupils).

On the other hand results shows that Dodoma and Iringa on average had large number of pupils who are in difficult circumstances (161 pupils and 89 pupils respectively). While Singida had average of 60 pupils in difficult circumstances and Njombe had average of 56 pupils in difficult circumstances.

Table 12: Average of school attendance, dropout and pupils in difficult circumstances by regions

Region	Attendance		Dropout		Pupils in Difficult Circumstances		Mean number of pupils
	Mean	SD	Mean	SD	Mean	SD	
Dodoma	80.09	11.13	18	15.25	161	388.96	878
Iringa	89.62	6.52	18	24.53	89	45.09	452
Njombe	91.64	11.83	23	33.95	56	26.77	376
Singida	86.26	7.40	8	4.81	60	66.45	650

3.3 Assessment of Children Under Five Years of Age

3.3.1 Nutrition Status Children Under Five Years of Age

The assessment of nutrition status of children under five was based on three nutrition indicators namely; HAZ, WHZ and WAZ. These indicators were estimated based on WHO growth standards of 2006. HAZ indicator was used to measure the linear growth of the child by comparing height of the assessed child with height of a standard child of the same age and sex. WHZ indicator was used to measure body mass of a child by comparing weight of the assessed child with weight of a standard child of the same height/length and sex. While WAZ indicator was used to measure child weight by comparing weight of the assessed child with weight of a standard child of the same age and sex.

The WHO Anthro software used to calculate HAZ, WHZ and WAZ has pre-specified z-score range for these indicators. HAZ; the range was -6.0 to 6.0, WAZ; the range was -6.0 to 5.0 and WHZ; the range

was -5.0 to 5.0. As a result children with z-scores out of these ranges were flagged. Therefore the dataset had 5.3% children with flagging values of either in HAZ, WHZ, WAZ, WHZ and HAZ, WHZ and WAZ or all the three indicators. After removing flagging values the sample size was reduced from 2181 to 2066 children, with 475 children from Dodoma, 540 children from Singida, 473 children from Iringa and 578 children from Njombe.

Being estimated the z-scores for all children; these values were categorised in difference nutrition status based on WHO growth standard of 2006. Those children with HAZ below -2 SD from median of reference population were considered short for their age (stunted). In nutrition context stunting is called chronic malnutrition, which results from long term inadequate nutrients intake and/or presence of diseases. While those children with HAZ above +2 SD from median of reference population were categorised as over-nutrition for their age. Finally those with HAZ between -2 SD and +2 SD as compared to reference population were categorised as normal linear growth for their age.

Children with WHZ below -2 SD from median of reference population were classified as thin for their height (wasted). This indicator shows acute malnutrition in children under five. It reflects recent inadequate nutrients intake and/or presence of diseases in a child. Moreover those with WHZ above +2 SD from median of reference population were categorised as over-nutrition for their height, while those who had WHZ between -2 SD and +2 SD as compared to reference population were categorised as normal weight for their height.

Finally for WAZ indicator, children with WAZ below -2 SD from median of reference population were categorised light for their age (underweight). This indicator reflects a combination of chronic and acute malnutrition and/or presence of diseases. Further for those children with WAZ above +2 SD from median of reference population were classified as overweight for their age, while those with WAZ between -2 SD and +2 SD as compared to reference population were classified as normal weight for their age.

Results of this survey (Table 13) shows that in general the prevalence of stunting, wasting and underweight were 51%, 4.4% and 17.1% respectively. Further male children had higher prevalence of stunting and underweight as compared to their counterparts (54% and 18.5% for stunting and underweight in male and 48.2% and 15.9% for stunting and underweight for female). Similar prevalence of wasting was observed for male and female children. For the case of regional prevalence of malnutrition, it was observed that Iringa had higher prevalence of stunting (59%) followed by Njombe (57.8%), while for wasting and underweight higher prevalence were observed in Singida and Dodoma (5.6% and 5.5% for wasting respectively and 18.7% and 17.9% for underweight respectively). Similar results of wasting and underweight were observed in Njombe and Iringa.

Age of children was categorised with special focus on first 1000 days of a child. The first group had children of age 6 - 24 months, while the rest were grouped by one year interval. Results in Table 13 shows that prevalence of stunting was above 40% in all 4 age groups, with the highest prevalence stunting was observed in age group of 25 – 36 months (58.3%). The higher prevalence of wasting was observed among children of age group of 6 – 24 months (5.9%), while children of age category 37 – 48 months had smallest prevalence of wasting. Results also showed that the prevalence underweight was increasing as age increased. The age category of 6 – 24 months children, it was observed that prevalence of stunting, wasting and underweight were 48.6%, 5.9% and 15.3% respectively. Further assessment done by children living status (Table 13) shows little difference for prevalence of stunting and wasting between MVC and those who were non MVC. However MVC had higher prevalence of underweight (22.03%) as compared to their counterparts (15.41%). Table A4 in the appendix shows similar results stunting and wasting between MVC and those who were non MVC by regions, while MVC were more affected with underweight in all four regions as compared to their counterparts.

Emerging problem of over nutrition among population in the developing countries had motivated the assessment for the magnitude of the problem. Presence of both under nutrition and over

nutrition in the society is termed as double burden of malnutrition. In general result (Table 13) shows lower prevalence of over nutrition for HAZ and WAZ indicators (2.95% and 1.26% respectively). Further little difference was observed for all three indicators across sex, while high prevalence of over nutrition for WHZ was observed in Njombe region.

Table 13: Percent distribution of children under five classified stunted, wasted, underweight, over-nutrition, overweight and normal in the surveyed households by sex, age group, children living status and regions.

Variables	Height for Age			Weight for Height			Weight for Age		
	Stunted	Over-nutrition	Normal	Wasted	Over-nutrition	Normal	Under weight	Over weight	Normal
Sex									
Female	48.2	3.69	48.11	3.96	5.81	90.23	15.85	1.47	82.67
Male	54.03	2.14	43.83	4.89	6.42	88.69	18.45	1.02	80.53
Age Group in months									
6 - 24	48.63	5.57	45.79	5.9	8.31	85.79	15.3	2.62	82.08
25 - 36	58.27	1.21	40.52	4.44	4.84	90.73	17.94	0.2	81.85
37 - 48	49.62	1.01	49.37	1.76	4.53	93.7	17.13	0.25	82.62
49 - 59	47.66	0	52.34	2.73	3.13	94.14	21.48	0	78.52
Children living status									
MVC	53.27	2.91	43.83	4.84	4.84	90.31	22.03	1.45	76.51
Non MVC	50.7	3.08	46.22	3.99	6.16	89.85	15.41	1.33	83.26
Regions									
Dodoma	43.79	3.58	52.63	5.47	3.58	90.95	17.89	0.63	81.47
Iringa	58.99	1.9	39.11	3.38	6.77	89.85	16.28	1.69	82.03
Njombe	57.79	3.46	38.75	3.29	10.9	85.81	15.57	2.25	82.18
Singida	42.96	2.78	54.26	5.56	2.59	91.85	18.7	0.37	80.93
Over All	50.97	2.95	46.08	4.4	6.1	89.5	17.09	1.26	81.66

MUAC is another indicator that is often used for assessing nutrition status. This indicator is normally used as a proxy indicator for assessing acute malnutrition. During analysis this variable was categorised as follows; children with MUAC below 12.5 cm was classified as Global Acute Malnutrition, children with MUAC between 11.5 cm and 12.5 cm were classified as Moderate Acute Malnutrition and Children with MUAC above 12.5 cm were classified normal. Being estimated the prevalence of Global Acute Malnutrition by sex, age group, children living status and region; prevalence of Global Acute Malnutrition which was below 5% was categorised as acceptable nutrition situation, prevalence of 5% - 9.9% was categorised as serious nutrition situation, prevalence of 10% - 14.9% was classified to critical nutrition situation and prevalence above 15% was classified as very critical nutrition situation (MUCHALI, 2012). Results in Table 14 shows the overall

prevalence of Global Acute Malnutrition was below 5%, which is an acceptable nutrition situation and all variables assessed had Global Acute Malnutrition prevalence below 5% which also an acceptable situation too. Further similar prevalence of Global Acute Malnutrition was observed among MVC and non MVC and little difference was observed for prevalence of Moderate Acute Malnutrition between groups. Analysis done by region (Table A5) shows MVC had higher prevalence of Moderate Acute Malnutrition as compared to their counterparts in two regions; Njombe (7.08%) and Iringa (6.93%).

Table 14: Percent distribution of global and moderate malnutrition and normal nutrition for children under five by sex, age group, children living status and by region.

Variable	MUAC Categories		
	Global Acute Malnutrition	Moderate Acute Malnutrition	Normal Nutrition
Sex			
Female	1.29	4.42	94.29
Male	0.82	3.98	95.21
Age Group in months			
6 - 24	1.42	7.54	91.04
25 - 36	0.81	2.42	96.77
37 - 48	0.76	0.76	98.49
49 - 59	0.78	1.17	98.05
Children Living Status			
MVC	1.69	5.33	92.98
Non MVC	0.91	3.99	95.1
Regions			
Dodoma	0.63	2.95	96.42
Iringa	0.85	5.71	93.45
Njombe	1.04	5.02	93.94
Singida	1.67	3.15	95.19
Over All	1.06	4.21	94.72

3.3.2 Birth Weight

In this study results showed that the average birth weight was 3.34 kilograms with standard deviation of 0.68 for Dodoma, average birth weight for Iringa was 3.2 kilograms with standard deviation of 0.56, for Njombe; average birth weight was 3.12 kilograms with 1.22 standard deviation and finally for Singida; average birth weight was 3.24 kilograms with standard deviation of 0.64 kilogram. Results in Table 15 shows that there was similar prevalence of low birth weight among

male and female children. Little proportion difference was observed between MVC and non MVC, however in this case higher prevalence of low birth weight (21.43%) was observed in non MVC. While Singida region showed higher prevalence of low birth weight as compared to other three regions (36.85%). Further Singida result (Table A6 in Appendix) shows that 39.66% of non MVC were born with low birth weight as compared to MVC.

Table 15: Percent distribution of low birth weight and normal birth weight by sex, children living status and regions

Variables	Birth Weight Categories	
	Low Birth Weight	Normal Birth Weight
Sex		
Female	20.46	79.54
Male	21.61	78.39
Children Living Status		
MVC	19.13	80.87
No MVC	21.43	78.57
Regions		
Dodoma	20	80
Iringa	14.8	85.2
Njombe	12.11	87.89
Singida	36.85	63.15
Overall	21.01	78.99

3.3.3   Breast Feeding and Complementary Feeding

3.3.3.1 Breast Feeding

In this study 91% of all assessed children received colostrum while 8.5% did not receive it and 0.7% of children their mother/guardian did not remember whether their children received colostrum. Mothers/guardians who did not feed colostrum to their children had the following reasons; (1) Colostrum is dirty (4.74%), (2) It courses diarrhoea to children (0.19%), (3) Children failed to breastfeed at that time (0.39%) and (4) Mother died soon after delivery (0.24%). Some of those who did not give colostrum soon after delivery alternatively they gave them water (1.6%) and others gave water with sugary/glucose (0.44%) to the new born.

WHO recommends for a minimum of two years for a child to be breastfed, however mothers may continue breast feeding up to 36 months. Hence mothers whose baby had age of 6 – 36 months

were assessed on current breast feeding practices, 43% of all children were currently breastfed. About 10% of children of age 25 – 36 months were recently continuing with breastfeeding. Further regional and gender breast feeding practices (Table 16) shows similar proportion of recent breastfeeding practices of about 40%. Generally it is recommended that frequency of breast feeding to be on child demand. But for new born of age below one month it is recommended to breastfeed them 8 to 12 times a day. Results of this study shows that majority of interviewed mothers were breastfeeding on demand for all four regions and across sex around 32% children were breastfed on demand. For the case of children living status majority were breastfed on demand in both groups as compared to other breast feeding frequency.

Moreover for the case of age for ceasing breast feeding, majority of interviewed mother in four regions ceased breastfeeding at age of 13 – 24 months (see Table 16). Few mothers continued breast feeding up to age of 25 - 36 months, for instance in Dodoma 16% of children were breastfed up to age between 25 - 36 months. However other regions proportions of breast feeding cessation for children of age above 24 months were below 10%. Analysis done by children living status shows that majority of MVC ceased breast feeding at age between 1 – 12 months (20.75%) while few MVC continued breastfeeding until age between 25 – 36 months (7.55%). On the other hands there were children who ceased breastfeeding at age of 1 – 12 months, majority were in Iringa followed by Njombe (18.4% and 11.7% respectively). Factors that led to breast feeding cessation includes; (1) Children being grown up (27%) (2) Mothers being pregnant (8%) (3) Mothers being sick (3%) (4) Some children refused breastfeeding (2.8%).

Table 16: Percentage distribution of current breast feeding status, frequency of current breastfeeding and age group for ceasing breast feeding by sex, children living status and region

Regions	Currently Breast Feeding		Frequency of Breast Feeding				Age in Months for Ceasing Breast Feeding		
	Yes	No	Below 3 times	3 times	6 times	On child demand	1 - 12	13 - 24	25 - 36
Sex									
Female	42.76	57.24	0.81	1.89	1.35	32.48	11	79.67	9.33
Male	43.16	56.84	0.74	2.52	1.34	32.05	8.66	79.53	11.81
Children Living status									
MVC	36.82	63.18	0.77	1.53	0.38	30.27	20.75	71.7	7.55
Non MVC	43.46	56.54	0.8	2.09	1.2	32.27	7.76	80.6	11.64
Region									
Dodoma	41.99	58.01	1.58	1.89	2.21	30.28	3.91	79.89	16.2
Iringa	43.79	56.21	0	1.47	0.88	36.28	18.42	72.11	9.47
Njombe	46.75	53.25	1.5	3.24	1	37.41	11.74	79.81	8.45
Singida	38.62	61.38	0	1.97	1.4	24.44	5.53	85.71	8.76

3.3.3.2 Complementary Feeding

Results in Table 17 shows in general 23.8% of children were complemented with carbohydrates foods (including babanas, rice, Stiff porridge, *Maandazi*, cassava, *kande*, sweet potatoes and irish potatoes), 19.9% were given porridge only and 52.2% were given porridge and other foods like fruits, rice, *togwa*, vegetables, eggs, banana, cassava and stiff porridge for a day. Analysis done by sex shows that female children had slightly higher proportion of eating carbohydrates foods, porridge only and porridge with other foods as compared with their counterparts. For the case of analysis by age group it was observed that there was higher prevalence of carbohydrate foods intake for children of age 25 - 36 months (30.6%) and age category of 6 – 24 months were frequently eating porridge with other foods (54.3%). Children living status variable shows similar proportion between MVC and non MVC in all types of complementary foods. Further in all four regions majority of children were eating carbohydrate foods, porridge only and porridge with other foods as compared to other types of foods. In Dodoma, Iringa and Njombe there were no children drinking juice.

Table 17: Percent distribution of complementary foods used by children of age 6 – 36 months by sex, age group, children living status and regions

Variables	Types of complementary foods						
	Tea	Juice	Left Over of Stiff Porridge	Milk, Eggs and Fruits	Carbohydrates Foods	Porridge Only	Porridge With Other Foods
Sex							
Female	0.53	0.18	0.35	2.63	24.74	20	51.58
Male	0.6	0.2	0.4	3.42	22.74	19.72	52.92
Age groups in months							
6 - 24	0.54	0.27	0.27	2.3	20.81	21.49	54.32
25 - 36	0.61	0	0.61	4.59	30.58	16.21	47.4
Children living status							
MVC	0.55	0	0	4.95	20.33	19.78	54.4
Non MVC	0.52	0.13	0.52	2.49	24.64	19.66	52.03
Regions							
Dodoma	1.06	0	0.53	6.91	14.89	25.53	51.06
Iringa	1.02	0	0	3.05	26.44	17.29	52.2
Njombe	0.28	0	0	1.98	28.9	11.9	56.94
Singida	0	0.87	1.3	1.3	19.91	30.74	45.89
Overall	0.56	0.19	0.37	3	23.81	19.87	52.2

3.3.4 Child Feeding Practices

Child feeding practices for children under five is also an important indicator for household food and nutrition security. WHO recommend 2 to 3 meals for infants of 6 - 8 months and 3 to 4 meals for infants of 9 - 23 months per day. Results in Figure 5 shows that in general in all four regions majority of children were fed three meals per day regardless of child's age. Dodoma and Singida regions showed that children above 10% ate 2 meals per day while in Iringa and Njombe children who eat 2 meals per day were below 10%. In all four regions children consumed 4 and 5 meals per day were below 20%.

Figure 5: A plot for child feeding frequency in terms of number of meals per day.

3.3.5 Foods Consumed by Children Under Five

Food consumption pattern for three days preceding this survey was assessed. Results were summarised in Table 18 by type of foods consumed and by region. Larger proportion of children consumed porridge as a breakfast for all three days in all four regions. Other children consumed tea with snacks and some consumed left overs for breakfast. Small proportions of children reported the consumption of vegetables and fruits and juices and *Togwa*. Similar results with breakfast were observed for snacks consumed at 10:00 AM for porridge, tea, vegetables and fruits. Lunch time larger proportion of children were eating stiff porridge (was consumed with green vegetables, beef stew, fish stew and beans) followed by carbohydrates foods (rice with beef stew, rice with beans, irish potatoes, sweet potatoes, bananas, *makande*, *maandazi*, cassava and spaghetti) for all four regions in three days. Few children at lunch consumed vegetables and fruits. For the case of dinner

small proportion of children in Dodoma consumed vegetables while in other regions children did not consume vegetables with dinner.

Table 18: Percentage of children under five consumed listed foods during three days prior the survey

Days	Region	Tea with snacks	Left Overs	Stiff Porridge	Milk	Carbohydrates	Porridge	Juice and Togwa	Vegetables and Fruits
					Breakfast				
Day 1	Dodoma	30.79	6.11	3.82	2.8	1.02	55.22	0.25	0
	Iringa	38.7	0	8.04	0.65	4.57	48.04	0	0
	Njombe	30.77	0.37	13.55	0.92	9.34	44.69	0	0.37
	Singida	9.71	10.82	7.51	3.97	1.55	62.69	3.75	0
Day 2	Dodoma	30.97	4.99	2.62	2.89	2.62	55.91	0	0
	Iringa	40.53	0	8.02	0.67	2.23	48.33	0	0.22
	Njombe	29.09	0.38	13.69	0.95	10.27	44.68	0	0.95
	Singida	11.71	12.16	7.43	3.6	1.35	60.36	3.15	0.23
Day 3	Dodoma	31.83	5.63	3.94	2.25	1.97	54.08	0.28	0
	Iringa	36.01	0	10.36	0.78	4.66	48.19	0	0
	Njombe	28.19	0.88	11.23	0.88	11.23	46.92	0.22	0.44
	Singida	8.72	14.1	6.92	4.1	1.28	59.49	5.38	0
					Snacks at 10:00 AM				
Day 1	Dodoma	35	0	3	7	1	53	0	1
	Iringa	28.57	0	9.52	1.59	14.29	41.27	0	4.76
	Njombe	33.33	0	16.67	1.04	14.58	31.25	1.04	2.08
	Singida	9.68	3.23	16.94	16.13	4.84	41.94	6.45	0.81
Day 2	Dodoma	34.34	0	2.02	7.07	3.03	53.54	0	0
	Iringa	22.03	0	6.78	5.08	16.95	49.15	0	0
	Njombe	28.26	0	18.48	1.09	14.13	34.78	0	3.26
	Singida	11.11	4.27	16.24	17.09	2.56	44.44	4.27	0
Day 3	Dodoma	28.26	0	5.43	4.35	2.17	59.78	0	0
	Iringa	22.73	0	6.82	4.55	13.64	50	0	2.27
	Njombe	24.29	0	14.29	4.29	15.71	38.57	0	2.86
	Singida	5.22	4.35	19.13	18.26	1.74	46.09	5.22	0
					Lunch				
Day 1	Dodoma	0	0	91.14	0.68	3.18	5	0	0
	Iringa	0.22	0	85.56	0.66	8.53	4.6	0.22	0.22
	Njombe	0.36	0	85.82	0.36	9.16	4.13	0	0.18
	Singida	0.19	0.77	85.74	3.47	2.89	6.74	0.19	0
Day 2	Dodoma	0.23	0	90.47	0.93	3.72	4.42	0.23	0
	Iringa	0.22	0	80.62	0.45	12.25	5.57	0.67	0.22
	Njombe	0.19	0	81.54	0.38	13.56	4.14	0	0.19
	Singida	0	0.6	84.69	1.59	5.17	7.16	0.6	0.2
Day 3	Dodoma	0.5	0.25	88.86	1.24	2.48	6.44	0.25	0
	Iringa	0	0	83.55	0.78	9.92	5.74	0	0
	Njombe	0.22	0	82.14	0.44	12.42	4.58	0	0.22
	Singida	0.22	1.33	83.11	2.22	4.89	7.78	0.44	0

Table 18: Percentage of children under five consumed listed foods during three days prior the survey

Days	Region	Tea with snacks	Left Overs	Stiff Porridge	Milk	Carbohydrates	Porridge	Juice and Togwa	Vegetables and
					Snacks Evening				
Day 1	Dodoma	3.14	0	51.31	5.24	9.42	26.7	2.09	2.09
	Iringa	3.33	0	48.57	0.95	23.33	21.9	0.95	0.95
	Njombe	2.02	0	52.53	0.51	17.68	21.21	0	6.06
	Singida	0.94	2.35	48.36	8.45	9.86	24.41	4.23	1.41
Day 2	Dodoma	3.98	0.57	55.11	5.11	6.82	26.7	0.57	1.14
	Iringa	1.98	0	53.96	0.99	20.3	21.29	1.49	0
	Njombe	2.17	0	46.74	1.63	22.83	20.65	0.54	5.43
	Singida	0.5	2.48	53.47	9.41	7.43	24.26	1.98	0.5
Day 3	Dodoma	2.76	0	53.1	4.83	6.21	29.66	1.38	2.07
	Iringa	0.65	0	50.32	2.58	21.29	21.94	1.94	1.29
	Njombe	2.48	0	38.84	2.48	14.88	30.58	0	10.74
	Singida	0.68	3.38	41.89	11.49	8.11	30.41	3.38	0.68
					Dinner				
Day 1	Dodoma	0.33	0	73.53	3.27	18.63	4.25	0	*0*
	Iringa	0.33	0	76.97	0.33	17.43	4.93	0	*0*
	Njombe	0.46	0	73.73	0.92	20.74	4.15	0	0
	Singida	1.29	0.26	78.09	3.35	9.79	6.19	1.03	0
Day 2	Dodoma	0.99	0.33	76.49	2.32	13.25	5.63	0.33	0.66
	Iringa	1.37	0	79.45	0	13.7	5.48	0	0
	Njombe	0.24	0	76.61	1.19	16.47	5.25	0.24	0
	Singida	0.79	0.26	79.1	3.44	10.05	6.35	0	0
Day 3	Dodoma	1.33	0.33	73.33	3.67	16	5	0.33	0
	Iringa	0.75	0	81.72	0	12.31	5.22	0	0
	Njombe	0	0	80.1	0.5	14.43	4.98	0	0
	Singida	1.62	0.27	83.56	2.7	5.93	5.93	0	0

3.3.6 Vitamin A Supplementation and Vaccination

In this study children were assessed whether they were vaccinated or not by looking at children clinic cards, however type of vaccine received was not identified during the assessment. Results in Table 19 shows that 98% of all children received vitamin A supplements and 99.6% of all children were vaccinated. Similar proportions of children who received vitamin A supplements and vaccinated were observed across sex, age group, children living status and regions.

Table 19: Percent distribution of vitamin A supplementation and vaccination by sex, age, children living status and region

Variable	Vitamin A Supplementations		Vaccination	
	Yes	No	Yes	No
Sex				
Female	98.32	1.68	99.81	0.19
Male	97.93	2.07	99.38	0.62
Age Group in months				
6 - 24	97.79	2.21	99.89	0.11
25 - 36	98.98	1.02	99.38	0.62
37 - 48	98.21	1.79	99.49	0.51
49 - 59	97.62	2.38	99.21	0.79
Children Living Status				
MVC	97.79	2.21	99.26	0.74
Non MVC	98.08	1.92	99.64	0.36
Regions				
Dodoma	96.57	3.43	99.57	0.43
Iringa	98.51	1.49	100	0
Njombe	98.95	1.05	99.48	0.52
Singida	98.29	1.71	99.43	0.57
Over all	98.13	1.87	99.61	0.39

4.   Discussion and Recommendations

4.1 Household Food Security Assessment

Results showed that households in Dodoma and Singida produce less food as compared to households of Iringa and Njombe. This is because the Dodoma and Singida regions are located in semi-arid central part of Tanzania. This limits the agricultural production that depends on rainfall. Further this survey depicted that major source of food at household level is through cultivation followed by those used both cultivation and buying food. Therefore researches on other drought tolerant seeds, short period maize seeds and construction of irrigation schemes are important for sustainable food availability in Dodoma and Singida regions. Since households in Dodoma and Singida produces less the amount of food stored was also small and it was only for few months when it is compared with Iringa and Njombe. This was expected because Iringa and Njombe are among large food producers in Tanzania.

Nutrition status results of women showed that prevalence of underweight of women in Dodoma and Singida were higher as compared to Iringa and Njombe. These results were in agreement with household production level whereby regions with low household food production had higher prevalence of underweight among women. However there were still cases of underweight women for households in Iringa and Njombe, indicating that under nutrition is beyond food availability. MUAC results supported BMI whereby highest prevalence of global acute malnutrition were observed in Dodoma followed by Singida.

Women workload analysis of this survey indicated that women were responsible for many household responsibilities such as cooking, washing clothes, fetching water, collecting firewood, taking care of invalids and taking children to clinics. This is has direct impact on women nutrition status. If it happens that they don't eat enough food then they are more likely to be malnourished. However this is not the only reason for malnutrition among women, other factors were beyond the scope of this survey. Based on results of this survey the following recommendations were proposed;

- Results of this survey were in agreement with existing researches, High household production were in Iringa and Njombe while Dodoma and Singida had low level of household production. Therefore here the Government is challenged to widen transport network between central part of Tanzania and southern part in order to allow easy transportation of food crops from southern part when there is food shortage in central part of Tanzania.

- Many households are still relying on maize as a staple food. Since this crop requires stable rainfall extension agricultural officers should continue to promote community to cultivate drought tolerant food crops like cassava and millet as alternative food crop. Promotion of production of drought tolerant cash crops like sunflower will increase household income which will allow households to access food in the markets.

- Inspection of household's storage places and equipment is important in order to avoid possibilities of household members to consume foods that are already damaged with fungus

and insects or contaminated. Further Community should be sensitized on better ways of storing vegetables which retain nutrients.

- This survey showed many household consumed varieties of fruits and vegetable, community workers should continue promoting the consumption of these foods at household level in order to benefit their nutrients and reduce micronutrient deficiencies.

- Finally there were households with low standard toilet and others did not have rubbish pits, Community workers should emphasize to communities the importance of good toilets and rubbish pits for household health and good nutrition.

- Communities should be involved in maintenance of all sources of water and government in collaboration with other water stakeholders should provide good water infrastructure.

4.2 Primary School Children Assessment

Many school children assessed in this survey were not taking breakfast at home, many of them were in hurry for school number because they were living far from their schools. Other reasons were not having food for breakfast at home, parent had other responsibilities in the morning and habit of not eating in the morning. For those who had their breakfast at home there were some of them who ate left overs alone which is not good for children in the morning. Further Large proportion of assessed school children went to school without carrying food. If it happens that these children study in schools that do not provide school meals class in concentration of these children will be affected due to hunger. If the problem persist these children are vulnerable to different forms of malnutrition like acute malnutrition and micronutrient deficiencies. These problems have direct impact on child learning ability and school attendance.

Results of nutrition status assessed based on BMI for age showed little difference of prevalence of thinness between MVC and non MVC, this call for nutrition interventions for all school children regardless of children living status. Comparing prevalence of thin school children by regions; Singida and Dodoma regions indicated higher prevalence of thin school children as compared with Iringa and

Njombe regions. In Dodoma there were schools with school feeding program and yet the prevalence of thinness were still high (Farkwa and Gonga had prevalence of 32.65% and 29.17% respectively). In Singida there were also schools with very high prevalence of thinness, for instance Siuyu, Ntanduu, Kinyeto and Umanyika primary schools (68%, 60%,58%, 54% respectively) while these schools reported to provide school meal.

Depending on school assessed, school feeding program present were either permanent or seasonal. Source of food were either from parent contribution, WFP food aid or from school farms. However results in Singida were a little bit contradicting. Majority of schools in this regions stated that the present school feeding programs were permanent while major source food was WFP food aid of which might end when the project is over or when there is no funds to support the project. Based on result several recommendations were drawn;

- In school that are not providing school meals, communities around schools should be trained on importance and effects of food and nutrition insecurity among school children so that they may contribute more food for these schools. NGO might help schools in building kitchen and providing cooking utensils.

- Further schools with farms but does not provide meals to school children, headmaster or headmistress should be trained on the importance of school meals for children in terms of reducing dropout, absenteeism, reducing level of malnutrition among school children and its contribution to school performance.

- Nutrition issues; priority should focus in schools with high level of thin children, whereby in-depth study should be planned so that to identify factors contributing existing under nutrition. There after plan specific nutrition interventions to address issues that will be raised.

- Having higher prevalence of thinness even in schools with school feeding programs, this call for a review of existing school feeding programs to make sure they reflect nutrition issues.

- School teachers should be encouraged to provide vegetables in school meals once a day at least during vegetable season for schools with vegetable garden.

- In schools that have no possibilities of providing school meals, parents should be encouraged to provide children appropriate breakfast for instance porridge or tea with snacks instead of left overs (like stiff porridge). Also they should provide their children with small take away because majority of schools were far. These take away can be foods that are available in the household for example boiled sweet potatoes, boiled cassava, boiled maize, bread and fruits such as oranges, mangoes and guava.

- School that were providing school meals in Dodoma and Singida regions were heavily depending on WFP food aid. These schools should be prepared to own the program by looking for other means of getting foods like cultivating their own food or parent food contribution.

- In all four regions, there schools with nutrition follow-up projects. Detailed study should be conducted in order to identify types of nutrition issues addressed and existing strength, opportunities and challenges of the projects. This information will help on designing comprehensive nutrition follow-up.

- A comprehensive nutrition follow-up should be designed and conducted at least once in a year in order to monitor progress of nutrition status of school children.

4.3 Under Five Children Assessment

Overall results showed level of stunting were above 40% across sex, age group and regions. While wasting and underweight were above 3% and 15% respectively. Male children had high prevalence of stunting and underweight as compared to female children. Analysis done by regions showed regions (Iringa and Njombe) with high household food production had lager prevalence of stunting and less household food producers (Dodoma and Singida) showed higher prevalence of wasting and underweight.

Furthermore results of malnutrition status by age showed high level of stunting, wasting and underweight for children of age of 6 to 24 months. The possible reason for these high rates of malnutrition is that at 6 months children are introduced to complementary foods while continue with breast feeding up to 24 months. Therefore inappropriate and inadequate complementary feeding may result into malnutrition for majority of children. Highest prevalence of stunting ws observed among children of age 25 – 36 months. Similar results of prevalence of stunting and wasting was observed between MVC and non MVC. However larger proportion of underweight was observed for MVC. For the case of children born with low birth weight, lager proportion of low birth weight was observed in children non MVC. Based on findings of this survey the following recommendations were proposed.

- Maternal nutrition education; since pregnant mothers are vulnerable to anaemia and other forms of malnutrition. Education and counselling on good maternal nutrition should be provided in clinics and at community level in all four regions.

- It was observed that regions with higher household food production had higher prevalence of stunting. Therefore knowledge on appropriate infant and young child feeding is required in these regions and reduction of women work load will help mothers to have more time for their babies.

- Continue encouraging pregnant mothers to use treated bed net so that prevent them from incidence of maleria during pregnancy. This will contribute in to optimal growth of unborn babies.

- Lactating mothers should be encouraged to give their new born colostrum and continue with exclusive breast feeding for six months.

- Provide education on adequate and appropriate (quality and variety foods) complementary feeding. Mother should be encouraged to continue breast feeding their babies while complementing.

- Time for ceasing breast feed should be at two years or above. Mothers who are healthy and their babies are okay should be encouraged on continuing with breast feeding their babies every time they attend clinics. More efforts should be directed to mothers in Njombe and Iringa regions which showed large proportion of ceasing breast feeding at child age between 1 -12 months.

- Results of this study showed small proportion of children who consumed fruits and vegetables. Communities should be encouraged to cultivate vegetable at household level for their own consumption. This will help children with vitamins and minerals.

- Other approach for reduction of micronutrient deficiency is through promotion of using fortified foods with important micronutrients for instance wheat flour and maize flour and edible oil.

- Monitoring system for stunting, wasting and underweight for children under five at household level should be designed. This program can be done at least once in a year; however institution responsible should prepare tools like questionnaires, weighing scales, length board, MUAC tapes for collecting data and database for storing collected data.

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Appendix

Table A1: Percent distribution of Height for Age, Weight for Height and Weight for Age Z-scores by region

Region	Variables	Height for Age			Weight for Height			Weight for Age		
		Stunted	Over-nutrition	Normal	Wasted	Over-nutrition	Normal	Under weight	Over weight	Normal
	Sex									
Dodoma	Female	39.37	5.12	55.51	3.54	2.76	93.7	15.75	0	84.25
	Male	48.87	1.81	49.32	7.69	4.52	87.78	20.36	1.36	78.28
Iringa	Female	60.17	2.07	37.76	3.73	6.22	90.04	17.84	2.07	80.08
	Male	57.76	1.72	40.52	3.02	7.33	89.66	14.66	1.29	84.05
Njombe	Female	54.55	5.19	40.26	2.92	11.69	85.39	11.69	3.25	85.06
	Male	61.48	1.48	37.04	3.7	10	86.3	20	1.11	78.89
Singida	Female	39.01	2.13	58.87	5.67	1.77	92.55	18.79	0.35	80.85
	Male	47.29	3.49	49.22	5.43	3.49	91.09	18.6	0.39	81.01
	Age Group in months									
Dodoma	6 - 24	46.43	6.12	47.45	8.67	3.06	88.27	18.88	1.02	80.1
	25 - 36	54.62	2.52	42.86	3.36	5.88	90.76	19.33	0	80.67
	37 - 48	37.5	2.08	60.42	1.04	2.08	96.88	12.5	1.04	86.46
	49 - 59	25.81	0	74.19	4.84	3.23	91.94	19.35	0	80.65
Iringa	6 - 24	52.75	3.67	43.58	4.13	8.72	87.16	11.01	3.67	85.32
	25 - 36	16.91	0.21	8.46	4.96	4.96	90.08	16.53	0	83.47
	37 - 48	62.5	0	37.5	0	4.55	95.45	23.86	0	76.14
	49 - 59	63.04	0	36.96	2.17	6.52	91.3	26.09	0	73.91
Njombe	6 - 24	52.65	6.71	40.64	4.95	14.49	80.57	14.84	4.24	80.92
	25 - 36	64.41	0	35.59	1.69	9.32	88.98	14.41	0.85	84.75
	37 - 48	56.86	0.98	42.16	0.98	8.82	90.2	12.75	0	87.25
	49 - 59	68	0	32	2.67	2.67	94.67	24	0	76
Singida	6 - 24	41.28	5.5	53.21	6.42	4.59	88.99	16.97	0.92	82.11
	25 - 36	49.28	1.45	49.28	7.25	0	92.75	21.01	0	78.99
	37 - 48	43.24	0.9	55.86	4.5	2.7	92.79	19.82	0	80.18
	49 - 59	35.62	0	64.38	1.37	1.37	97.26	17.81	0	82.19

Table A2: Percentage of colostrum consumption at birth by regions

Regions	Colostrum consumption at birth		
	Yes	No	Don't know
Dodoma	94.88	3.84	1.28
Iringa	82.88	16.49	0.63
Njombe	91.46	8.19	0.35
Singida	93.51	5.75	0.74
Over All	90.8	8.47	0.73

Table A3: Percent distribution of BMI for age categories by regions and student status

Region	Student status	BMI for age z-score Categories		
		Normal	Thin	Overweight
Dodoma	MVC	84.44	14.79	0.78
	Non MVC	79.55	17.21	3.24
Singida	MVC	66.86	32.28	0.86
	Non MVC	69.21	29.72	1.06
Iringa	MVC	88.67	9.39	1.94
	Non MVC	91.48	6.69	1.83
Njombe	MVC	93.5	5.8	0.7
	Non MVC	93.75	2.94	3.31

Table A4: Percent distribution of children living status and their nutrition status by regions

Region	Children Living status	Height for Age			Weight for Height			Weight for Age		
		Stunted	Over-nutrition	Normal	Wasted	Over-nutrition	Normal	Under weight	Over weight	Normal
Dodoma	MVC	46.36	4.55	49.09	6.36	2.73	90.91	20.91	0	79.09
	Non MVC	42.71	3.39	53.9	5.08	3.05	91.86	15.25	1.02	83.73
Iringa	MVC	57.43	1.98	40.59	1.98	5.94	92.08	20.79	2.97	76.24
	Non MVC	58.96	2.02	39.02	3.47	6.65	89.88	14.16	1.45	84.39
Njombe	MVC	61.06	4.42	34.51	4.42	8.85	86.73	18.58	2.65	78.76
	Non MVC	56.41	3.5	40.09	2.8	10.72	86.48	14.45	2.33	83.22
Singida	MVC	47.19	0	52.81	6.74	1.12	92.13	29.21	0	70.79
	Non MVC	42.46	3.35	54.19	5.03	2.79	92.18	17.88	0.28	81.84

Table A5: Percent distribution of children living status and MUAC categories by regions

Regions	Children Living Status	MUAC Categories		
		Global Acute Malnutrition	Moderate Acute Malnutrition	Normal Nutrition
Dodoma	MVC	0.91	4.55	94.55
	Non MVC	0.34	2.71	96.95
Iringa	MVC	0.99	6.93	92.08
	Non MVC	0.87	4.62	94.51
Njombe	MVC	1.77	7.08	91.15
	Non MVC	0.7	4.43	94.87
Singida	MVC	3.37	2.25	94.38
	Non MVC	1.68	3.91	94.41

Table A6: Percent distribution of children living status and birth weight categories by regions

Regions	Children Living Status	Birth Weight Categories	
		Low Birth Weight	Normal Birth Weight
Dodoma	MVC	19.09	80.91
	Non MVC	20.34	79.66
Iringa	MVC	15.84	84.16
	Non MVC	14.74	85.26
Njombe	MVC	12.39	87.61
	Non MVC	12.35	87.65
Singida	MVC	31.46	68.54
	Non MVC	39.66	60.34

Table A7: Percent distribution of children living status and current breastfeeding practice, frequency of breast feeding and age of ceasing breast feeding by regions

Region	Children Living Status	Currently Breast Feeding		Frequency of Breast Feeding				Age in Months for Ceasing Breast Feeding		
		Yes	No	Below 3 times	3 times	6 times	On child demand	1- 12	13 - 24	25 - 36
Dodoma	MVC	37.68	62.32	2.9	2.9	1.45	27.54	14.63	70.73	14.63
	Non MVC	41.92	58.08	1	0.5	1.99	30.85	0	82.46	17.54
Iringa	MVC	28.79	71.21	0	0	0	25.76	28.26	65.22	6.52
	Non MVC	46.27	53.73	0	1.56	0.78	37.89	15.22	74.64	10.14
Njombe	MVC	37.5	62.5	0	1.37	0	32.88	20.45	75	4.55
	Non MVC	47.7	52.3	1.97	3.29	1.32	37.17	10	80.63	9.38
Singida	MVC	45.1	54.9	0	1.89	0	35.85	17.86	78.57	3.57
	Non MVC	36.29	63.71	0	2.47	0.82	21.4	4.52	84.52	10.97

Table A8: Percent distribution of children living status and types of complementary foods by regions

Region	Children Living Status	Types of complementary foods						
		Tea	Juice	Left Over of stiff porridge	Milk, Eggs and Fruits	Carbohydrates foods	Porridge only	Porridge with other foods
Dodoma	MVC	0	0	0	14.71	11.76	29.41	44.12
	Non MVC	1.57	0	0.79	3.15	13.39	25.98	55.12
Iringa	MVC	0	0	0	1.79	28.57	8.93	60.71
	Non MVC	0.89	0	0	3.57	25.89	20.09	49.55
Njombe	MVC	1.67	0	0	3.33	21.67	20	53.33
	Non MVC	0	0	0	1.86	30.11	10.04	57.99
Singida	MVC	0	0	0	3.13	12.5	28.13	56.25
	Non MVC	0	0.7	2.1	1.4	22.38	31.47	41.96

Table A9: Percent distribution of children living status and vitamin A supplementation, vaccination by regions

Regions	Children Living Status	Vitamin A Supplementations		Vaccination	
		Yes	No	Yes	No
Dodoma	MVC	95.41	4.59	100	0
	Non MVC	96.53	3.47	99.3	0.7
Iringa	MVC	99.01	0.99	100	0
	Non MVC	98.26	1.74	100	0
Njombe	MVC	98.2	1.8	98.21	1.79
	Non MVC	99.06	0.94	99.76	0.24
Singida	MVC	98.84	1.16	98.84	1.16
	Non MVC	98	2	99.43	0.57