Food Security Incidences Based on Monetary and Caloric Poverty Lines in Mbeya and Makete Districts, Tanzania

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Abstract

In Tanzania, a food monetary poverty line of TZS[1] 10,219 per adult equivalent for 28 days in 2007 prices and a caloric poverty line of 2,200 kcal per adult equivalent per day are used. However, it is not known where their uses give similar incidences of food security. Generation of empirical information on this was worthwhile to inform choices of which of the lines should be more preferable. This study sought to determine food security based on monetary and caloric poverty lines in Mbeya and Makete Districts. The specific objectives of the study were to: (1) Determine food security based on the national monetary poverty line, (2) Determine food security based on caloric food poverty line, and (3) Compare food security incidences based on the two poverty lines. Multistage sampling was used to select 233 households. The research was a cross-sectional one and was conducted through structured interviews using a questionnaire, focus group discussions and key informant interviews. Using the national food monetary and calorific food poverty lines, it was found that 82.8% and 79.0% of the 233 sampled households were food secure in Mbeya and Makete respectively. Monetary and caloric food poverty lines gave almost similar results of food security incidences, albeit the monetary food poverty line gives slightly higher food security incidences. It is concluded that the two poverty lines give almost similar food security incidences and have good potential to give reasonable results of food security status. It is recommended that the government and other stakeholders dealing with food security should use both food poverty lines almost equally since they give almost the same results.

Keywords: Food security, monetary, calorific, poverty line, Southern Highlands, Tanzania

1.0 Introduction

Food security and poverty are defined in different ways by international organizations and researchers. A number of attempts have been made to define and clarify dimensions and the key features of food security and poverty. "Food security, at the individual, household, national, regional and global levels exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 1996, cited by Pottier, 1999). Food security is a development issue since food insecurity impacts negatively on many other indicators of wellbeing. While developed countries of Europe, North America and Northern Asia hardly have the problem of food insecurity, most developing countries especially in Sub-Saharan Africa (SSA), South Eastern Asia and Pacific have it. While poverty is conceived as a lack of enough income necessary to buy a bundle of goods to guarantee the survival of a person, food insecurity is implicitly assumed as a sub-category of poverty (Sibrian, 2008). Poverty is also considered as a basic deprivation of well-being to live comfortably and includes lack of adequate food, shelter, education, health and vulnerability to natural disasters such as floods and droughts (Namara *et al.,* 2010). In an attempt to define poverty, researchers associate it with the causes or manifestations of food insecurity. Indeed there are variations and/or different views on how poverty should be defined and what it means to be poor. Poverty is caused by lack of adequate resources and capabilities to acquire basic needs. Poverty tends to increase food insecurity; ignorance; and prevalence of diseases. However, the most commonly used definition emphasises the income dimension of poverty because all indicators listed earlier, for instance food insecurity and malnutrition, ignorance, and prevalence of diseases are translated through inadequate income flow. In other words, income is regarded as a relevant wellbeing indicator and therefore poverty occurs when one is unable to attain a minimum standard of living. Following this definition, poverty is measured by income or expenditure level that can sustain a minimum standard of living (Msambichaka, *et al.,* 2003). However, it is argued that income is a poor indicator of wellbeing (Greeley, 1994) because one having much income may not use it to acquire other necessities. Therefore, besides income, some other non-income aspects are used to supplement income as a measure of poverty.

The multi-dimensional characteristics of poverty have prompted scholars to construct two poverty

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[1] USD 1 equals about TZS 1784 in November 2014

lines namely food expenditure poverty line and basic needs poverty line. Food expenditure poverty line is associated with expenditure on food (consumption) and/or food poverty, which is generally defined as a condition of lacking the resources necessary to acquire a nutritionally adequate diet. The food poverty line is the estimated cost of acquiring the amount of recommended calories and/or nutritional requirements at the subsistence level. The basic needs poverty line is the minimum cost of living that specifies the consumption bundle deemed to be adequate for basic consumption needs (NBS, 2009). In Tanzania, two food poverty lines are used: the monetary food poverty line of TZs 10,219 per adult equivalent for 28 days in 2007 prices, and the caloric poverty line 2,200 kcal per adult equivalent per day. According to NBS (2009) the proportion of population below the monetary food poverty line was 16.6% in 2007. However, the proportion of the population below the caloric poverty line was not estimated.

Smallholder farmers in Mbeya and Makete Districts recognise food insecurity and poverty as problems affecting them in many aspects, such as having less than three meals per day, less frequencies of protein food intake, particularly meat and fish per week, malnutrition among children and lack of income to buy other foodstuffs (Socio-economic profiles; Mbeya Rural 2003, Makete 2008). Mbeya and Makete Districts have good climate and high agricultural potential and suitable environment which enable people to undertake various agricultural and non-agricultural activities. The districts are suitable for production of food and cash crops, presence of land suitable for irrigation and excellent local, national and border market demands. Besides farm activities, smallholder farmers are also involved in various non-agricultural activities to increase their incomes. It would be expected that most of households would increase crop production and incomes from non-agricultural activities and eventually become food secure.

Evaluation of various methods of food security determination has been done. For example, a study report by Kayunze *et al.* (2010) compared food security incidences in terms of dietary energy consumed per adult equivalent and per capita, both per day, based on data covering seven days, one month and one year in Rufiji District, Tanzania. However, comparing food security incidences based on monetary values of food and dietary energy consumed has not been done. Accordingly, it was not known which of the two methods was better than the other one. Therefore, the specific objectives of this paper were to: a) determine food security based on monetary poverty line, b) determine food security based on caloric poverty line and c) compare food security incidences based on the two methods in the study area. The study had potential to generate empirical information on which of the two poverty lines is better in explaining incidences of food security.

2.0 Methodology
2.1 Description of the Study Area
The research on which this paper is based was conducted in Mbeya Rural and Makete Districts, Mbeya and Njombe regions. Mbeya District is among the eight districts of Mbeya Region. The district covers an area of 2,432 square kilometres of which 1,898 square kilometres is arable land ideal for agricultural production (Socio-economic profile; Mbeya District, 2003). The district is administratively divided into three divisions namely Tembela, Isangati and Usongwe having 25 wards, and 148 villages, but the research was confined to two divisions: Tembela and Isangati from which two wards namely Tembela and Santilya were selected. Four villages, two from each of the two selected wards, were selected for the research. The villages were Ilembo Usafwa, Shibolya, Sanje and Mpande.

Makete District is one of three districts in the newly established (October 2013) Njombe Region. The district covers an area of 5,800 square kilometres of which 4,195 square kilometres is arable land ideal for agricultural production (Socio-economic profile; Makete District, 2008). The District is administratively divided into six divisions namely Ikuwo, Ukwama, Lupalilo, Bulongwa, Magoma and Matamba having 17 wards and 97 villages. As for Mbeya District, the research was confined to two divisions: Bulongwa and Lupalilo from which two wards namely Isapulano and Kipagilo were selected. Four villages, two from each of the two selected wards, were selected for the research. The villages selected were Ivilikinge, Isapulano, Kitula and Iyoka. The basis for selecting the villages was their high and low production of round potatoes in some of them and their production of other cash crops besides round potatoes and production of food crops particularly maize, wheat and beans.

2.2 Research Design
The target population was all households in areas where agricultural production and other economic activities were common in Mbeya Rural and Makete Districts. A cross-sectional design was used and data were collected once. Multistage sampling was used in selection of respondents. The first stage involved selection of two divisions per district based on the number of major food and cash crops grown. The second stage involved selection of one ward from each division from each of the two divisions per district making four wards, depending on above criteria. The third stage involved random selection of two villages from each ward making a total of eight villages. That means four villages per district were selected. The last stage was sampling of respondents using systematic sampling. The sampling frame was households which were involved in agricultural

production and other economic activities.

2.3 Data Collection

Primary data were collected through interview schedules using a structured questionnaire. Both quantitative and qualitative information types were collected. Key informant interviews were held with people who had in-depth understanding and knowledge on food security in the respective districts. Key informants included District Agricultural and Livestock District Officers (DALDOs), village and ward extension officers, village government leaders, leaders of farmer groups and traditional elders. The information collected was compared and contrasted with the literature which was reviewed in the Ministry of Agriculture, Food and Cooperatives; District Agricultural and Livestock Development Offices (DALDOs) in Mbeya Rural and Makete Districts; Agricultural Research Institute–Uyole, Mbeya; Sokoine National Agricultural Library (SNAL); and websites. The information collected included major crops grown and production trends, production technologies, production constraints, opportunities, food security status, major causes of food insecurity and poverty, current food security improvement and poverty reduction programmes.

2.4 Data Processing and Analysis

The primary quantitative data collected were analysed using the Statistical Package for Social Sciences (SPSS) software. Data were analysed by computing descriptive statistics to determine frequencies, percentages, statistical means, and standard deviations of individual variables. Moreover, inferential analysis was done by using one-way ANOVA to compare levels of food security based on (i) kCal consumed and (ii) monetary value of food consumed. In the first case, the grouping variable was age category: young age (19-35), middle age (36-50) and old (51-71). In the second case, the grouping variable was household size: small (1-3), medium (4-6) and large (7 to highest). In the third case, the grouping variable was land size: small (0.5 – 5.0 acres); medium (5.1 – 10.0 acres) and large (10.1 acres to the highest). Lastly, the grouping variable was acreage under potato production: small acreage with non-agricultural activities, small acreage without non-agricultural activities, large acreage with non-agricultural activities and large acreage without non-agricultural activities.

2.5 Adjustment of the Food Monetary Poverty Line and Various Monetary Values

Due to the fact that the same amount of money has different values in different periods of time, the food monetary poverty line was expressed in real terms in the year 2012 prices when data for the research were collected. This was done using average seasonally adjusted consumer price indices for the years concerned as illustrated in (Table 1). Seasonally adjusted consumer price indices were used because they are identical to patterns that a time series appears to follow during corresponding months of successive years (BoT, 2012).

2.6 Adult Equivalent Units Computation

Cognisant of the fact that if variables like income and dietary energy consumed are expressed per capita they do not reflect good comparative figures in households with different sizes and composition by age and sex, dietary energy consumed was expressed per adult equivalent following the procedure used by Collier *et al.* (1990). In order to calculate adult equivalent units, the sex and age of every household member were recorded. A two-step procedure was followed whereby in the first step adult equivalent scales for East Africa by age and sex were added up for all household members to get all the household members in terms of adult equivalents. The equivalent scales are presented in Table 2. The second step involved adjusting the above adult equivalents for economies of scale due to the fact that larger households need fewer resources per person due to sharing some facilities. The economies of scale are taken into account by multiplying the adult equivalent units by the average cost (Table 2) corresponding to the number of people in the household. The adjusted adult equivalent units were used as denominators for calculating values per adult equivalent in particular households.

2.7 Food Security Based on Monetary Poverty Line Determination

Monetary values of various foodstuffs eaten by all members of household were determined. The food items included home produced items, food received as gifts and food payments in kind for work done. Both quantities and monetary values for each food item consumed were recorded. Some food items which were in local units were converted using appropriate conversion factors prepared by Lukmanji *et al.* (2008). Monetary values of all food items consumed by all households were expressed per adult equivalent units for 28 days. The food poverty line in Tanzania, according to Household Budget Survey 2007 (NBS, 2009), was 10,219 per adult equivalent for 28 days in 2007 prices. Therefore, expressing monetary values of food types eaten for 28 days was aimed at obtaining results which are comparable with national data of food security. In this research the poverty line of 10,219 of 2007 was adjusted to its equivalent in 2010 prices by multiplying the 2007 monetary food poverty line of TZs 10,219 by a factor of 1.3259943. This factor was obtained by applying cross-multiplication to the seasonally adjusted consumer indices of 2007 and 2010 as illustrated in Table 1. Then the 2010 equivalent

monetary food poverty line was adjusted to its 2012 equivalent by applying cross-multiplication to the seasonally adjusted consumer price indices of 2010 and 2012. A factor of 1.34 was multiplied by the 2010 equivalent monetary food poverty line of TZs 13,550.34 to get TZS 18,212 which was the poverty line of 2012. Based on this poverty line, the households were said to be food poor based on the national monetary food poor if they had consumed less than TZS 18,212 per adult equivalent in 28 days and not poor based on the national monetary food poor line if they had consumed equal to and higher than TZS 18,212 per adult equivalent for 28 days in 2012 prices.

2.8 Food Security based on Caloric Poverty line determination

In order to determine food security based on caloric poverty line, all food items consumed by all household members were used. Based on data collected using a household questionnaire, quantities of all food items consumed for 28 days were recorded. Quantities of dietary energy consumed in all the food items were computed based on Tanzania Food Composition Tables Lukmanji *et al.,* (2008). Dietary energy consumed was adjusted for the number of individuals in the household based on sex and age. Table 2 gives the adult equivalence scales that translate children into adult equibalents and also compare women and men. Moreover, household size is represented by the number of adult equivalents rather than simply the number of individuals. The basis for such translation has mostly been the nutritional requirement of individuals by age and sex. Based on these adjustments, the quantities of dietary energy consumed by all household members were expressed per adult equivalent units per day and per capita per day based on all foodstuffs consumed for 28 days. In this case households were said to be food insecure if they had consumed less than 2100 kCal per capita per day or less than 2200 kCal per adult equivalent per day.

3.0 Results and Discussion

3.1 Food Security Based on Monetary Food Poverty Line

The results showed that the mean monetary value of food consumed in 28 days per adult equivalent was TZS 37,233, with minimum and maximum values of TZS 3,413.33 and TZS 922,000.00 respectively and a standard deviation of 62,085.38. The monetary value of food consumed per adult equivalent for 28 days was divided into two groups of food secure and food insecure households based on the national monetary food poverty line described above. The results showed that 74.1 % and 91.5% of households from Mbeya Rural and Makete Districts respectively were food secure (Table 3). The proportions of food insecure households were 25.9% and 8.5% from Mbeya Rural and Makete Districts respectively.

The results from this study showed that different agricultural and non-agricultural activities were commonly done among the respondents' households. During focus group discussions and key informant interviews, the participants mentioned the major crops grown to be potato, maize, wheat, beans and vegetables. They also mentioned the main non-agricultural activities to include casual labour, local brewing, petty trade, remittances, timber trade, loan and renting out business houses. The results on acreage of land under cultivation showed the mean to be 3.9 acres. This is not surprising, given that it has often reported that smallholder farmers in Tanzania farm on small and fragmented plots (Sokoni, 2008). They also showed the minimum and maximum of 0.5 and 19.0 acres respectively and a standard deviation of 2.8 acres. Acreages under cultivation per household were categorized into small (0.5 – 5.0) acres, medium (5.1 – 10.0) acres and large (10.1 – 19.0) acres groups. The majority of the households were in the 0.5 to 5.0 acres group, and this accounted for 87.1% and 71.8% in Mbeya Rural and Makete Districts respectively. This indicates that the majority of the households surveyed were small scale farmers.

3.2 Food security based on caloric food poverty line

The results on food secure and food insecure households based on the caloric poverty line of 2200 kcal per adult equivalent per day showed the mean of 3,368.6kcal/AE/day. They also showed minimum and maximum values of 792.88 and 21,100 kCal/AE/day respectively and a standard deviation of 1,728.1 kcal/AE/day. The proportions of food secure households based on caloric poverty line were 68.1% and 89.7% from Mbeya Rural and Makete Districts respectively. Food insecure households were 31.9% and 10.3% from Mbeya Rural and Makete Districts respectively.

Food security based on monetary food poverty and caloric poverty lines were found to be almost similar, although slightly more food security incidences were obtained using monetary food poverty line. Overall results of the households surveyed were 82.8% and 79.0% food secure in Mbeya and Makete Districts respectively (Table 3 and 4). Moreover, the results revealed that food secure households based on caloric food poverty line in Makete District were slightly higher than those in Mbeya District. This could be due to the temperate climate whereby round potato, maize and wheat are widely grown and are often intercropped with beans and vegetables. Makete District's Socio-Economic Profile (2007) indicates that the district has vast economic opportunities. For the people of Makete, the agricultural sector ranks number one of which selling of

crops was the main source of income. This might mean that they have enough food to eat and cash for other household needs throughout the year. This was evidenced by the respondents during focus group discussion and key informant interviews. They pointed out that for them cash and food crops are sold interchangeably to enhance their incomes and ensure food availability throughout the year.

3.3 Comparisons of Food Security Based on the two Poverty Lines

The amounts of kCal consumed per adult equivalent per day were significantly different (F=7.424, p < 0.001) among households with heads of different age categories (Table 5). In households headed by young (19-39) years household heads the highest levels of kCal were consumed compared to households headed by middle (36-50) years and old (51-71) aged household heads. The results might imply that young household heads are stronger and are expected to cultivate larger farms than middle and old aged household heads. Similarly, in households headed by young household heads foodstuffs with the highest monetary value were consumed compared to the other households. However, the differences were not significantly different (F = 2.17, p > 0.05). Food security based on kilocalories consumed per adult equivalent per day was also compared by household size categories. The results showed that small households consumed the highest amounts of kilocalories and the kilocalories consumed among small, medium and large households differed significantly (F = 25.537, p < 0.001) (Table 5. However, there was no significant difference (F = 2.42, p > 0.05) in monetary values of foodstuffs consumed among the three categories of household. These results are contrary to results of some previous researches, e.g. by Kayunze (2000) and Kamuzora (2001) that in rural areas the larger the household size, the higher people are better off, including being more food secure. The explanation for these findings was that it happens more where households have more labour force in terms of a larger proportion of adult members who work either on farm or otherwise.

Food security based on caloric poverty line was also compared among households with different land size categories (Table 5). The land size categories were between 0.5 – 5 acres, 5.1 – 10 acres and 10.1 to the highest. The results indicate that there was no significant difference in the kilocalories consumed among the three categories of household (F = 0.816, p > 0.05). This might imply that most of the farmers were not using improved agricultural technologies. Other studies, for example by Reddy *et al.* (2004) and Asogwa *et al.* (2012), reported that households with larger farm sizes tend to be more food secure than those with smaller farm sizes. Food security based on monetary poverty line was compared by land size categories. The results indicated that there were no statistically significant differences (F = 0.254, p > 0.05) among households with different land size categories in the study area.

Acreage under potato production per household was divided into four categories as follows: 1) Small acreage with non-agricultural activities, 2) Small acreage without non-agricultural activities, 3) Large acreage with non-agricultural activities, and 4) Large acreage without non-agricultural activities. The four categories were compared based on the two poverty lines, that is caloric and monetary poverty lines. The results showed that, based on caloric poverty line there were no significant differences (F = 2.435, p > 0.05) among the four categories. Moreover, based on monetary poverty line, there were no significant differences among the four categories (F = 2.276, p > 0.05)

4.0 Conclusion and recommendations

Based on the national monetary and the national caloric poverty lines the study concludes that the majority of the sampled households in the study area are food secure. Based on this conclusion, the two poverty lines give almost similar food security incidences and have potential to give good results of food security status, albeit the monetary food poverty line gives slightly higher food security incidences. It is recommended that the government and other stakeholders dealing with food security should use both food poverty lines almost equally since they give almost the same results.

Based on caloric poverty line, there were significant differences between households with different household heads age and household size categories in the study area. However, contrary to prior expectations, food security was not significantly different by land size under cultivation, which means that land size cultivated is not a good predictor of food security status in the study area. Based on this conclusion, farmers are urged to improve their land productivity in order to improve their food security statuses rather than increasing land size. Moreover, the government and policy makers are urged to help farmers of Mbeya and Makete Districts improve land productivities through provision of inputs at subsidized prices.

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Table 1. Seasonally Adjusted Consumer Price Indices (SACPI) for Tanzania Mainland

Year	Seasonally Adjusted Consumer Price Indices	Factors for Inflation of Various Years Monetary values to 2012	Values of the 2007 Food Monetary Poverty Line (Poverty line x the relevant inflation factor)
2007	140.8		10,219.00
2010	186.7	186.7/140.8 = 1.3259943	13,550.34
2012	134.4	134/100 = 1.34	18,211.65

Source: BOT (2007, 2010 and 2012), Base years, 2001=100, September 2010 =100

Table 2. Adult equivalent scales and Household economies of scale constants for East Africa

Age group	Adult equivalent by Sex	
	Male	Female
0 - 2	0.40	0.40
3 - 4	0.48	0.48
5 - 6	0.56	0.56
7 - 8	0.64	0.64
9 - 10	0.76	0.76
11 - 12	0.80	0.88
13 - 14	1.00	1.00
15 - 18	1.20	1.00
19 - 59	1.00	0.88
Above 60+	0.88	0.72
Household economies of scale constants		
Household size	**Marginal cost**	**Average cost**
1	1.00	1.000
2	0.892	0.946
3	0.798	0.897
4	0.713	0.851
5	0.632	0.807
6	0.632	0.778
7	0.632	0.757
8	0.632	0.741
9	0.632	0.729
Above 10+	0.632	0.719

Source: Latham (1965) and Deaton (1980), cited by Collier et al. (1990)

Table 3: Incidences of food security based on monetary poverty lines

Food status	Mbeya Rural		Makete		Both districts	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Food secure	86	74.1	107	91.5	193	82.8
Food insecure	30	25.9	10	8.5	40	17.2
Total	116	100	117	100	233	100

Table 4: Incidences of food security based on calorific poverty lines

Food status	Mbeya Rural		Makete		Both districts	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Food secure	79	68.1	105	89.7	184	79
Food insecure	37	31.9	12	10.3	49	21
Total	116	100	117	100	233	100

Table 5: Comparison of food security based on kCal consumed and on monetary values of food eaten

Age group of household head	n	Mean kCal consumed	Std. Dev.	Sum of Squares		df	Mean Square	F	Sig.
Comparison of kCal consumed by age group of household head									
Young (19 -35) years	95	3876.5030	2128.54642	Between Groups	4.202E7	2	2.101E7	7.424	0.001
Middle (36 - 50) years	107	2982.3548	1146.68227	Within Groups	6.509E8	230	2829793.197	-	-
Old (51-71) years	31	3145.0245	1689.06683	-	-	-	-	-	-
Total	**233**	**3368.5644**	**1728.15373**	Total	**6.929E8**	**232**	-	-	-
Comparison of monetary values of food eaten by age group of household head									

Age group of household head	n	Mean TZS used on food	Std. Dev.	Sum of Squares		df	Mean Square	F	Sig.
Young (19 -35) years	95	47198.1434	94358.18385	Between Groups	1.657E10	2	8.285E9	2.171	0.116
Middle (36 - 50) years	107	29212.5639	15807.98737	Within Groups	8.777E11	230	3.816E9	-	-
Old (51-71) years	31	34380.2809	21819.09192		-	-	-	-	-
Total	**233**	**37233.2905**	**62085.37873**	Total	**8.943E11**	**232**	-	-	-
Comparison of kCal consumed by household size									

House hold size	n	Mean kCal consumed	Std. Dev.	Sum of Squares		df	Mean Square	F	Sig.
Small (1-3)	58	4616.4865	2548.02522	Between Groups	1.259E8	2	6.295E7	25.537	0.000
Medium (3 - 6)	136	3051.1313	1110.42208	Within Groups	5.670E8	230	2465079.724	-	-
Large (6-10)	39	2619.6268	895.01045	-	-	-	-	-	-
Total	**233**	**3368.5644**	**1728.15373**	Total	**6.929E8**	**232**	-	-	-
Comparison of monetary values of food eaten by household size									

House hold size	n	Mean TZS used on food	Std. Dev.	Sum of Squares		df	Mean Square	F	Sig.
Small (1-3)	58	49454.1973	30735.34784	Between Groups	1.843E10	2	9.215E9	2.420	0.091
Medium (3 - 6)	136	36544.4897	77906.19501	Within Groups	8.758E11	230	3.808E9	-	-
Large (6-10)	39	21460.5804	8311.82701	-	-	-	-	-	-
Total	**233**	**37233.2905**	**62085.37873**	Total	**8.943E11**	**232**	-	-	-

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