Developing Country Studies
ISSN 2224-607X (Paper) ISSN 2225-0565 (Online)
Vol.6, No.8, 2016

Household Food Access Insecurity along the Urban-Rural Continuum in Morogoro and Iringa, Tanzania

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Abstract
The overall objective of this paper was to assess household food access insecurity along the urban-rural continuum of Morogoro and Iringa towns in Tanzania. The specific objectives were to: (1) measure the extent of household food access insecurity along the urban-rural continuum, and (2) identify the socio-economic characteristics associated with the household food access insecurity. The study was cross-sectional in design whereby a sample of 300 households was selected using a Geographic Information System (GIS)-based simple random sampling procedure. The primary data were collected through interview schedules using the Household Food Insecurity Access Scale (HFIAS) tool. The data were analysed descriptively and inferentially using the Statistical Package for Social Sciences (SPSS) software. Ordinal logistic regression was used to determine the influence of some household socio-economic characteristics on the household food access security. Generally, the results showed that the households that are located in the urban settings are more likely to be food access secure than the households situated in peri-urban and rural settings ($p \leq 0.001$). Other factors that had statistical significant effect on the household food access security include age and education level attained by household head, and non-farming activities. It was concluded that household food access insecurity is a widespread phenomenon along the continuum although it is more prevalent in rural as compared to urban settings. Thus, it is recommended that more opportunities for non-farming income generating activities engagements be created throughout the continuum to support the households that rely entirely on farming.
Keywords: household food access insecurity, urban-rural continuum, socio-economic characteristics, Morogoro and Iringa, Tanzania.

1. Introduction

Food insecurity is defined as a state of 'limited or uncertain ability to acquire acceptable foods in socially acceptable ways' (Crush and Frayne, 2011). An estimated 795 million people remain undernourished globally, down by 167 million over the last decade, and 216 lower than in 1990-92 (FAO, IFAD & WFP, 2015). This means that just over one in every nine people in the world are currently unable to consume enough food to conduct an active and healthy life. The vast majority of the hungry people live in developing countries, where an estimated 780 million, or 12.9% of people, were chronically underfed during the same time. In these regions, the prevalence of undernourishment has dropped by 44.4 percent since 1990-92. Despite the notable progress, large differences remain across regions, including Southern Asia, Eastern Asia, South-Eastern Asia, Africa and Latin America. Of all the regions, Sub-Saharan Africa remains the region with the highest prevalence of one in four people chronically hungry.

In Tanzania, basic needs poverty declined from 34.4% to 28.2% between 2007 and 2011/12 and food poverty declined from 11.7% to 9.7% (NBS, 2014). These poverty figures were estimated using, respectively, the national basic needs poverty line of TZS 36,482 per adult per month and the national food poverty line of TZS 26,085 per adult per month. Basic needs poverty implies that a person cannot meet his/her basic consumption needs while an extremely poor individual cannot afford to buy basic foodstuffs to meet the minimum nutritional requirements of 2,200 kilocalories (Kcal) per adult per day. Despite this significant progress, extreme poverty is particularly pervasive in rural areas, whereby 1.9 million people as compared to 0.75 million people in urban areas are estimated to be living in extreme poverty (NBS, 2014).

The estimates of the proportion of people whose expenditures are below the extreme poverty line in Morogoro and Iringa regions, respectively, were 14 percent and 10 percent in 2011/12 (NBS, 2014). Accordingly, it has been revealed that chances of a household being extremely poor are associated with its demographic structure and its socio-economic characteristics. For example, large household size, lower level of education of household head coupled with being economically inactive, and dependence entirely on a natural resource based livelihood such as farming tend to be food insecure. On the other hand, households tend to be food secure when they are part of the formal sector or has a member who receive wages, salary, or earn an income from business (WFP, 2013).

Urban food insecurity in Africa is emerging as an important development agenda (Crush and Frayne, 2011). This is challenging the long standing thinking that food insecurity is primarily a rural problem requiring a massive increase in smallholder production (AU, 2006; World Bank, 2008). The key argument is that in a continent undergoing rapid urbanization, the issue of urban food security has been neglected by governments, international

agencies, donors, NGOs and researchers. It is from this seemingly opposing development thinking that the current study was undertaken to investigate household food access along the urban-rural continuum with inclusion of intermediary stage i.e. peri-urban. The approach of taking the continuum was considered important since it allows for comparison of related variables within similar socio-cultural backgrounds. This has avoided the possibility of selecting subjects with different population backgrounds.

1.1 Urban-Rural Continuum in Morogoro and Iringa

Both Morogoro and Iringa towns are surrounded by vast arable land and are linked with wide road networks. The two towns have experienced rapid growth in both population size as well as area coverage in the last decade. Much of the surrounding rural areas have been converted into peri-urban conditions and there is high inter linkage of livelihood activities among the people living in these settings (i.e. urban, peri-urban and rural). Therefore, the two areas provide excellent study sites for assessing the urban-rural continuum.

Given the complexity of food security, especially in the urban settings, it is hoped that the findings will be of great aid to the policy makers and other practitioners in guiding operational responses in designing context-specific strategies for improving food accessibility in the increasing urbanization conditions facing the Tanzanian society and the whole of sub-Saharan Africa.

1.2 Defining Urban-Rural Continuum

Urban-rural continuum, the merging of town, suburb and country, is a term used in recognition of the fact that in general there is rarely, either physically or socially, a sharp division, or a clearly marked boundary between the three, with one part of the population wholly urban, the other wholly peri-urban and the rest rural (Simon *et al.,* 2006; White *et al.,* 2008). Based on continuum conceptualization, urban, peri-urban and rural cannot be seen simply as dichotomous entities. They are interlinked and yet distinct from each other. This study intends to investigate whether this applies to the issues related to household food access as well.

Demographic and economic criteria on which definitions of urban, peri-urban and rural areas are based can vary widely between different nations, making generalizations problematic (Whitaker, 1983). According to Tacoli (1998), some authors differentiate these areas based on population size and density. Others base their definitions on the availability of services such as post office, tax office, public treasury, banking, running water supplies, electricity, and health and education facilities. However, the combination of criteria applied can vary greatly. Even the population thresholds used can be different. For example, in many African nations, it is 5,000 inhabitants, while for most Latin American and European nations it can be as low as 2,000 or 2,500, or even just a few hundred inhabitants (Tacoli, 1998). In the context of this research, the working definitions of urban, peri-urban and rural areas were established based on relevant reviewed literature (Moustier, 2001; Erenstein *et al.,* 2004; Drechsel *et al.,* 2006). The work of Iaquinta and Drescher (2000) strongly helped in the distinction of the urban, peri-urban and rural areas based on theoretical length of travel time (by car) from the town center. Accordingly, urban area is an area within a range of up to five travel minutes from the town center, peri-urban covers an area between 5 and 20 minutes from the town center and rural area is an area which travel time is more than 20 minutes from the town center. This approach has been applied by Schlesinger (2013) in other medium-sized towns in Africa and has worked well.

1.3 Socio-Economic Characteristics of Households

Food security, in general, is a complex phenomenon that manifests itself in numerous physical conditions resulting from multiple causes. Food security has four dimensions namely: food availability or supply, food accessibility, food stability and food utilization. Each of these dimensions can be measured by a set of specific indicators at individual, household, and national levels. This research focused on the food accessibility dimension at the household level. This is because according to FAO, IFAD and WFP (2015), the main concern in the Sub-Sahara African countries, Tanzania inclusive, is poor food access.

The socio-economic characteristics of individual households have been identified to be among the basic factors influencing the food security status of households (Sanusi *et al.,* 2006). A study in Addis Ababa city found that the socio-economic characteristics that influence household food insecurity status include household size, age and education level of household head, asset possession, access to credit service and access to employment (Gebre, 2012). A study by Babatunde *et al.* (2007) among farming households in Kwara State of North-Central Nigeria found that household income, ability for own production, education status of household head and household size were important in influencing the food access security. Leyna *et al.* (2008) and Knueppel *et al.* (2010) reported factors such as age, marital status, education, occupation, and religion to be important in influencing food security in rural settings of Tanzania. What is very clear from the review of all these studies is that inclusion of urban-rural continuum in the empirical analyses of factors that influence household food access has not been attempted, something that makes this paper quite unique and important.

2. Methodology

2.1 Study Area

The survey was conducted in Morogoro Municipality, which covered the urban and peri-urban while the rural part extended to two surrounding districts of Morogoro Rural and Mvomero. On the other hand, Iringa Municipality covered the urban and peri-urban part while the rural area extended to two surrounding districts of Iringa Rural and Kilolo. According to the recent 2012 Population Census, Morogoro Municipality has a population of 315,866 while Iringa Municipality has a population of 151,345. Both Morogoro and Iringa Municipalities are facing rapid influx of new residents causing major urban challenges in managing social and economic changes, whereby growing poverty is of particular importance.

2.2 Research Design and Sampling Procedure

A cross-sectional research design was employed whereby data were collected once from sampled households. Households were randomly selected through a multi-stage cluster sampling design. The first stage involved a purposive selection of two sites, namely Morogoro and Iringa. In stage two, three districts in both sites were purposively sampled to form the urban-rural continuum. Grid cells were then created on maps of the study sites using Geographical Information System (GIS) whereby random sampling was employed to select 10 grid cells each in urban, peri-urban, and rural settings. Further, the GIS-based random sampling was used to select five households in each grid cell. Accordingly, the sample size in each site was 150 households meaning that 50 households were, respectively, sampled in urban, peri-urban and rural settings. This approach was desired because it avoids human selection biases of locations and households. The sample size was pre-determined by the Livelihood Urbanization and Natural Resources in Africa (LUNA) project, which supported this study by establishing that a sample size of 150 households in each of the two study areas to be sufficient for reasonable analysis, using experience from previous projects (Schlesinger, 2013).

2.3 Data Collection

Primary data were collected through interview schedules using a structured questionnaire whereby both quantitative and qualitative information were sought. The questionnaire included standardized Household Food Insecurity Access Scale (HFIAS) questions (Coates *et al.,* 2007) consisting of a list of 9 specific questions about accessibility to food in the household during previous 30 days. Study respondents were preferably the spouse in charge of food provisioning and cooking in the household or the head of household. The Household Food Insecurity Access Prevalence (HFIAP) status indicator was used to categorize the interviewed households into four levels of household food access insecurity namely: food secure, and mildly, moderately or severely food insecure.

Before the questionnaire was administered to a respondent, verbal consent was sought after the local government official had introduced the researcher. Each participant was made aware that participation was entirely voluntary and that he/she could withdraw at any time if felt uncomfortable.

2.4 Data Analysis

Data compilation and processing started immediately after field work. Data processing involved editing, coding, and entering data by using the Statistical Package for Social Sciences (SPSS) software. Quantitative and qualitative data were generated and presented via frequencies, percentages, means, and standard deviations in SPSS. Ordinal logistic regression model was used to examine the influence of household socio-economic characteristics on food access security. The dependent variable (Y) was the four HFIAP outcomes, that is, food secure, mildly, moderately, or severely food access insecure. The independent variables included head of household's age, sex, highest education level attained and main economic activity. Others were household size and the location of household (whether the household was located in urban, peri-urban or rural setting). Ordinal logistic regression model was considered to be the most appropriate for this research because the dependent variable is a ranked one with ordered categories. In addition, the model was employed because it estimates the net effects of a set of explanatory variables on the dependent variable (Morgan and Teachman, 1988). The ordinal logistic regression model took the following form:

$$P(y) = \frac{e^{\alpha} + \beta_1 x_1 + \ldots \beta_k x_k}{1 + e^{\alpha} + \beta_1 x_1 + \cdots \beta_k x_k} \quad (1)$$

Where P(y) = the probability of the success alternative occurring, e = the natural log, α = the intercept of the equation, β_1 to β_k = coefficients of the predictor variables, and x_1 to x_k = predictor variables entered in the ordinal regression model.

Specifically in this study:

P(y) = the probability of a household being food secure, α = the intercept of the equation, $\beta_1 \ldots \beta_k$= regression coefficients, x_1 = age of household head (in years), x_2 = sex of household head (1=male and

0=female), x_3 = highest education grade attained by household head (number of years of schooling), x_4 = main economic activity of household head (0=none, 1=farming activity, 2=non-farming activities), x_5 = household size (number of people who sleep under same roof and take meals together at least four days a week), and x_6 = location of household (1=urban, 2=peri-urban, 3=rural).

3. Results and Discussion

Out of the 300 sampled households, only 279 households completed the data collection procedure. Of these households, 132 (or 47.3%) were in Morogoro study site while the remaining households were in Iringa site. Moreover, in Morogoro site, 31.1% of the households were situated in urban area compared to 33.3% and 35.6% in peri-urban and rural areas, respectively. On the other hand, 32.7% of the households in Iringa site were located in urban settings compared to 33.3% and 34% in peri-urban and rural settings respectively. Overall, 26% of the households in urban areas were headed by a female as compared to 14% and 22.7% in peri-urban and rural settings, respectively. Generally, the distribution of respondents was equal among the three locations of interests i.e. urban, peri-urban and rural.

3.1 Household Demographic Characteristics

Characteristics of household's heads are presented in Table 1. The mean age of the household's heads in urban areas was 40.51±12.18 years as compared to 42.12±12.31 and 42.50±12.76 years in peri-urban and rural areas, respectively. However, using one way ANOVA, there was no statistical difference in mean age of the household's heads from one spatial entity to another along the continuum ($p \geq 0.05$). The mean years of schooling for the participants was 9.19±3.56 in urban setting as compared to, respectively, 8.63±3.93 and 5.79±3.34 in peri-urban and rural settings. The majority of household's heads in rural areas have not completed seven years of primary school education as compared to their counterparts in urban and peri-urban areas who have gone to post-primary school education ($p \leq 0.001$).[1] One explanation is that in most cases parents in rural areas do not put much emphasis in education as compared to those in urban settings. A report by NBS (2014) affirms that the number of unschooled people in Tanzania is higher in rural areas as compared to the urban areas. Also, Table 1 shows that the surveyed households had an average of five members per household along the urban-rural continuum. Household size is an important variable which determines the state of household food security and expected to be inversely related with household food access security whereby an increase in household size implies more people to be fed from the limited resources (Garrett and Ruel, 1999; Beyene and Muche, 2010).

Table 1. Distribution of Study Population by Mean Age, Education, and Household Size along the Continuum

Variable	Mean (and Standard Deviation)			
	Urban (n=89)	Peri-urban (n=93)	Rural (n=97)	P-Value
Age (Years)	40.42(±12.18)	42.01(±12.31)	42.5(±12.76)	0.517
Years of schooling	9.26(±3.58)	8.84(±4.16)	5.79(±3.33)	0.000
Household size (persons)	4.72(±2.15)	5.09(±2.12)	5.13(±2.19)	0.365

Source: Own adjustment based on survey data

3.2 Main Economic Occupations

Table 2 shows that quite a huge proportion (86.6%) of the household's heads in urban area were involved in non-farming activities as compared to 75.3% and only 22.7% in peri-urban and rural areas, respectively. On the other hand, rural household's heads were more involved in farming activities (77.3%) compared to, respectively, 20.9% and 6.7% in peri-urban and urban settings ($p \leq 0.001$). One of the reasons rural households opt farming activities versus non-farming activities is due to presence of large farming area and easiness to engage in farming activities as compared to their counterparts in urban and peri-urban households. These findings are consistent with the national general report (NBS, 2014) that the proportion of households engaged in farming activities was highest in rural areas.

Table 2. Percentage Distribution of Household's Heads Based on Main Economic Occupations

Main economic occupation	Urban (n=89)	Peri-urban (n=93)	Rural (n=97)
Farming activities	6.7	20.4	77.3
Non-farming activities	86.6	75.3	22.7
Unemployed	5.6	4.3	0

Source: Own adjustments based on survey data

[1] According to the Tanzanian education system, a person spends the first seven years of formal education, which is considered as primary school. Then follows the next four years of ordinary level secondary school and two years of advanced level secondary school (also known as high school), before a person goes to University or other tertiary level education.

3.3 Household Food Access along the Urban-Rural Continuum

Using the categorical measure of household food access insecurity along the urban-rural continuum, there was statistical significant relationship ($p \leq 0.001$) between spatial location of the household and food access security status (Table 3). In that respect, household food access insecurity is more prevalent in rural households as compared to the urban and peri-urban households. On the other hand, urban households are more food access secured as compared to rural households. One explanation is that urban households have higher living of standards essentially because they have superior endowments in terms of family size and composition, education, assets, and access to services and employment opportunities as compared to rural households (NBS, 2014).

Table 3. Percentage Distribution of Categories of Household Food Insecurity Access along the Continuum

Categories of food access security	Urban (n=89)	Peri-urban (n=93)	Rural (n=97)
Food secure	53.9	47.3	25.8
Mildly food-insecure	11.2	17.2	12.4
Moderately food-insecure	19.1	23.7	34.0
Severely food-insecure	15.7	11.8	27.8

Chi-Square value = 22.471. P-Value = 0.000
Source: Own adjustment based on survey data

3.4 Household Socio-Economic Features and Food Access Security

To determine the influence of household socio-economic characteristic on the status of household food access, ordinal logistic regression was employed whereby β-coefficients (positive or negative) were computed to obtain the directions of the predictor variables' impacts, as indicated in Table 4. Five variables among seven were observed to be statistically significant, indicating that the variables contributed to the chances of the households being food secure. The overall model fit was statistically significant ($X^2 = 44.461$, $p = 0.000$), implying that the model was able to predict household food access security. A non-significant p-value of Goodness of Fit ($X^2 = 760.885$, $p = 0.634$) shows that the model fits well with the data, which is the case with this study. Nagelkerke Pseudo (R^2) was 0.151. This suggests that 15.1% of the variance in the dependent variable is explained by the independent variables that were entered in the model. The remaining 84.9% was probably due to other independent variables not included in the model (Mendenhall and Beaver, 1991).

Table 4. Influence of Socio-Economic Characteristics Variables on Household Food Access Security (N = 279)

Variable	Estimate	Std. Error	Wald	df	Sig.	95% C.I Lower Bound	95% C.I Upper Bound
Age of household's head	0.021	0.010	4.664	1	0.031	0.002	0.041
Education of household's head	0.488	0.156	9.846	1	0.002	0.183	0.793
Household size	0.020	0.055	0.127	1	0.721	-0.089	0.128
Male headed household	0.155	0.279	0.309	1	0.578	-0.392	0.702
Non-employed	-1.707	0.650	6.895	1	0.009	-2.980	-0.433
Urban setting	0.904	0.303	8.924	1	0.003	0.311	1.498
Peri-urban setting	0.734	0.294	6.244	1	0.012	0.158	1.310

Model fit ($X^2 = 44.461$, P-Value = 0.000); Goodness of Fit ($X^2 = 760.885$, P = 0.634)

Age of household head showed positive significant impact ($p \leq 0.05$) on household food access security. This means that as the age increases there is a tendency to have more access to food, and vice versa. This is consistent with other studies by Leyna *et al.* (2008) and Knueppel *et al.* (2010), respectively, in Kilimanjaro and Iringa, Tanzania. It is also consistent with other studies conducted elsewhere in the world (Radimer *et al.,* 1992; Kendall *et al.,* 1995; Studdert *et al.,* 2001; Nnkwe and Yegammia, 2002). Higher age could be attributed to more wealth accumulation which is important to improving household food access security.

Education level attained by the household head showed positive significant effect ($p \leq 0.01$) on household food access security. The possible explanation is that household head education largely contributes on working efficiency, competency, diversify income, adopting technologies and generally earning higher incomes than illiterate ones. These results are in conformity with studies conducted by Tingay *et al.* (2003), Hadley and Patil (2006), Hadley *et al.* (2007) and Leyna *et al.* (2008), which reported similar links between education attainment and household food security. They are also consistent with the results of the study conducted by Knueppel *et al.* (2010) in Tanzania and Sanusi *et al.* (2006) in Nigeria. In their study, Sanusi *et al.* (2006) reported that the households of secondary school teachers were more food secure than those of the teachers who were teaching in primary schools. The reason for this is clear, the former receive higher pay than the latter.

In addition, household's head being not employed showed negative impact ($\beta = -1.707$) on household food access security. This is evidenced by many studies conducted in developed and developing countries. A study conducted in slum areas of Bangkok found that households with unemployed household's heads were at greater

risk of food insecurity. Similarly studies by Sanusi *et al.* (2006), Leyna *et al.* (2008), Knueppel *et al.* (2010), and Mende *et al.* (2015) came up with similar results.

4. Conclusion and Recommendations

The study sought to assess household food access insecurity along the urban-rural continuum in Morogoro and Iringa, Tanzania. Specifically, the study measured the extent of household food access insecurity along the urban-rural continuum. Also, the socio-economic characteristics associated with the household food access insecurity were identified. Based on the findings it can be concluded that household food access insecurity is a widespread phenomenon in all points of urban-rural continuum, although the proportion of households that are moderately and severely food access insecure is higher in rural areas than in peri-urban and urban households. Similarly, food access security was found to be higher in urban households as compared to peri-urban and rural households. The results of the ordinal regression model indicated that five out of seven variables were significantly associated with household food access security in the study area. Age of household head and household being located in peri-urban settings were found to be statistically significant at less than 5% probability level while level of education attained by household head, household head being not employed, and household being located in urban were significant at less than 1% probability level. Age of household head, level of education attained by household head, and urban location of the household were found to be positively related with probability of being food access secure whereas household head being not employed was negatively related.

Possible areas of intervention emanating from the results of this study can be summarized as follows: age of household head has positive impact on household food access security. This means that as the age increases there is a tendency to have more access to food and vice versa. Therefore, capacity building for younger household heads should be given. The effect of education on household food access security confirms the significant role of the variable in consideration for betterment of living condition. Thus, strengthening both formal and informal education and vocational or skill training should be promoted. As expected, household head being not employed was negatively related with food access security. Therefore, it is recommended that more employment opportunities be created and the existing ones be strengthened to supplement what households currently have. Access to job helps urban households to diversify their income which in turn alleviates the food deficiency among poor households.

Also, household being located in urban and peri-urban settings had positive relationship with food access security. The presence of more infrastructures and job opportunities in urban settings increase the possibilities of urban dwellers to generate more income as compared to their counterparts in rural households who in most cases rely on farming activities only. Thus, infrastructure and services such as roads, electricity, and industries should be improved in rural areas so as to open more off-farm employment opportunities for rural households.

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