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Theoretical Determinants of Food Insecurity in Chamwino District, Tanzania

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Abstract: The causes of food insecurity in developing countries range from political instability to environmental degradation, poverty and poor health. While these factors are well documented, the theoretical determinants of food security in Chamwino District are not well documented. The purpose of this paper was, therefore, to determine the theoretical determinants of food security in Chamwino District, Tanzania. The study sought to: (1) rank some indicators of entitlement vis-à-vis those of pessimistic theory, optimistic theory, Woldemeskel's composite theories and family stress theory with regard to their relationship with food security and (2) determine the extent to which pessimistic, optimistic, entitlement, family stress and composite theories explain food security in the study area. A cross-sectional research design was used to collect data from 400 households which were randomly selected. Using multiple linear regression; household size, income from non-farm income generating activities, land cultivated and years of schooling significantly ($p \leq 0.05$) influenced food security. Further, it was found that entitlement in terms of income from non-farm income generating activities and land cultivated are the most important factors that determine food security in Chamwino District. It is concluded that the most important theory that determines food security in Chamwino District is entitlement in terms of income from income generating activities and land cultivated. Addressing these factors can help to improve food security than any other factors can do. The study recommends that promotion of income generating activities as alternative livelihood options should be pursued by both local and central government structures in Tanzania to improve food security.

Keywords: *Food insecurity, rank, Adult Equivalency, Chamwino*

1.0 introduction

Food security encompasses four dimensions, namely food availability, food accessibility, food utilization and stability of food supply (FAO *et al.*, 2018). Food availability refers to physical existence of food from own production or the market. Access to food derives from opportunities to produce food directly or to exchange other commodities or services for food (Maxwell, 1998). These opportunities, described by Sen (1981) in terms of entitlement, are based in turn on access to resources. Food access is ensured when communities, households and all individuals within them have adequate resources such as money, to obtain appropriate food items for nutritious diet (Riely *et al.*, 1995, cited, by Aidoo *et al.*, 2013). Sustainability refers to the temporal dimension of nutrition security (i.e. the time frame over which food security is being considered (Aidoo *et al*., 2013). When an individual or population lacks one or more of the outlined dimensions, the individual or population is said to be food insecure. Food insecurity is defined as lack of access to sufficient food (World Bank, 1986, cited by Maxwell, 1998). It has been estimated to affect 821 million of the global population (FAO *et al.*, 2018). Of these, 23.2% were inhabitants of Sub-Saharan Africa. In Tanzania, 9.7% of the people were food insecure in

2011/12 (NBS, 2014). Chamwino District has chronic food insecurity which leads to malnutrition. According to Mbwana *et al*. (2017), 41% of children under age of five were stunted, which is a sign of chronic malnutrition in the district in 2017. The causes of food insecurity are many; they include political instability, war and civil strife, macroeconomic imbalances, trade dislocations to environmental degradation, poverty, population growth, gender inequality, inadequate education and poor health (Smith *et al*., 2000).

While the above causes of food insecurity are well documented, the theoretical determinants of food security in Chamwino District are not well documented. Therefore, the purpose of this paper was to determine the theoretical determinants of food security in Chamwino District. The specific objectives were to: (1) to rank some indicators of entitlement vis-à-vis those of pessimistic theory, optimistic theory, Woldemeskel's composite theories and family stress theory with regard to their relationship with food security and (2) determine the extent to which pessimistic, optimistic, entitlement, family stress and composite theories explain food security in the study area.

2.0 Contentious Theoretical Issues Explaining Food Security

Pessimistic and optimistic contentions are two opposing perspectives about the relationship between population and food (Dyson, 1996). The pessimistic perspective is associated with the name of Thomas Robert Malthus (Dyson, 1996). Malthus argued that population, when unchecked, increases in a geometrical ratio while subsistence (i.e. food production) increases in arithmetic ratio (Dyson, 1996). Malthus argued that population would always grow until it reached or surpassed a food production unit imposed by the earth's ecological capacity (Brigham, 2003). Malthus was not the first person to suggest that population growth might outstrip the capacity to produce food (Dyson, 1996). In 200 A. D., when the world's population was about 200 million, Septimus Florence Tertulianus wrote: "the greatest evidence of large number of people: "We are burdensome to the world; the resources are scarcely adequate to us." (Holland, 1993 cited in Johnson, 2000). In 1588, Giovanni Botero argued that the world population's growth rate exceeded the earth's natural capacity to provide it with food (Brigham, 2003). The claim that world's population was growing faster than the production of grains has been reported by Brown and Kane (1994) who argue that humanity will soon face really colossal food problems. This dire perspective is sometimes termed 'neo-Malthusian' because in its emphasis on hunger, starvation, and famine it echoes themes popularized by Thomas Robert Malthus' polemical essay of 1798 (Dyson, 1996). People who believed in the above contentions were classical Malthusians; those who believe so until today are neo-Malthusians; and those who have contrary beliefs are called anti–Malthusians or Optimists. Instead of seeing a large and growing population as a problem for systems of food production, the optimists see these characteristics as both a sign and, indeed, a cause of prosperity (Dyson, 1996). Esther Boserup, one of the foremost optimists of the time, argued, in her now classic *Conditions for Agricultural Growth* (Boserup, 1965), that the direction of the causal arrow between population and food production growth trends was the opposite of what was claimed by both classical and neo-Malthusians (Brigham, 2003). Boserup argued that, through the challenges to society which it posed, population growth often actually worked as a major dynamic engine of agricultural change stimulating, in particular, the adoption of improvements in land use and technology (Dyson, 1996). Boserup's contentions are shared by other optimists, for example Julian Simon (Dyson, 1996). Julian Simon adopted an even more optimistic view; he claimed that the balance

between population and resources was actually improving, and that this positive trend was likely to continue (Simon, 1981; Gilbert, 1993 cited in Brigham, 2003). Julian Simon contends that rising standards of living are a result of increased productivity rates. Increasing productivity, in turn, is dependent upon technological progress, which in turn relies on the number of human minds (Brigham, 2003). Another optimist was Marquis de Condorcet (1743-94), who argued that the problem of over-population would be solved with reference to human reason (Brigham, 2003).

The entitlement approach was introduced by Sen (1981). Sen (1981) explains that famine emerges not because of food inadequacy but because of lack of access to food for people. Only those with entitlements are able to access food. Entitlements are defined as "the set of alternative commodity bundles that a person can command in a society using the totality of rights and opportunities that he or she faces" Sen (1984), cited in Devereux (2001). There are three building blocks to the entitlement approach. These are: (1) Endowments, which are all legal resources that can be used to obtain food and include money, land, machinery and animals, but also more abstract resources such as labour power, "know how", kinship and citizenship; (2) Entitlement mapping or E-Mapping, which is the terms of trade between endowments and food, goods and services; and (3) The entitlement–set which represents the basket of food, goods and services that a person can obtain using her/his endowment (Sen, 1981). It is, therefore, not surprising that in this study income and land ownership were positively affecting food security.

Composite theories recognize that food security attainment is determined by four elements: availability, institutional elements, market forces and possession. While Sen's approach is anchored in possession, recognizes and dismisses availability; it altogether ignores institutional elements and market forces (Woldemeskel, 2008). In other words, Woldemeskel says that Sen considered food availability like the pessimistic and optimistic theories proponents besides entitlement, but he neglected institutional elements and market forces (Woldemeskel, 1990). Sen offers no argument in favour of the priority he assigns to a possession-based entitlement approach over others. Woldemeskel (1990) maintains, on the other hand, that there are overriding reasons which favour priority assignment to an institution-based entitlement approach. Thus Sen's possession-based can only be seen as a partial explanation of famine causation.

3.0 Methodology

3.1 Description of the study area

The study was conducted in Chamwino District. This district was selected since it had a history of chronic food insecurity which leads to chronic malnutrition which is reflected by stunting. Mbwana *et al.* (2017) found that 41% of children under age of five were stunted in the district in 2017.

3.2 Research design, sampling procedures and sample size

A cross-sectional research design was used in this study, and the sampling unit was a household since food scarcity is ultimately experienced at the household level (Maxwell, 1996). Chamwino District was selected purposively because of its history of chronic food insecurity. Three wards were purposively selected due to their history of receiving food aid from the government (DAICO of Chamwino District, personal communication, 2014) while six villages

were selected purposively. These were Fufu Ward (Fufu and Suli Villages) and Idifu Ward (Idifu and Miganga Villages) where chronic food insecurity was relatively high and Membe Ward (Membe and Mlimwa Villages) where chronic food insecurity was relatively low. The respondents were selected randomly from the sampling frame which was established from the village register by listing all households headed by male and female heads with children aged 7 to 17 years old. The sample size was 400 households. The formula for sample size determination by Cochran (1977), cited by Bartlett *et al*. (2001) was used to determine the sample size as shown below:

$n = \frac{Z^2 * p\,(1 - p)}{d^2}$ (Cochran, 1977, cited by Bartlett *et al.* 2001), where:

n = sample size, Z = a value on the abscissa of a standard normal distribution (from an assumption that the sample elements are normally distributed), which is 1.96 or approximately 2.0 and corresponds to 95% confidence interval; p = estimated variance in the population from which the sample is drawn, which is normally 0.5 for a population whose size is not known; d = acceptable margin of error (or precision), whereby the general rule is that in social research d should be 5% for categorical data and 3% for continuous data (Krejcie and Morgan, 1970 cited in Bartlett *et al*., 2001). In this research, 5% was used since substantial categorical data were collected. Using a Z-value of 2.0, a p-value of 0.5, a q-value of 0.5, and a d-value of 0.5% (which is equivalent to 0.05), the sample size (n) was determined to be 400.

$n = \frac{2^2 * 0.5\,(1 - 0.5)}{0.05^2} = (4 \times 0.25)/0.0025 = 1/0.0025 = 400.$

3.3 Data Collection

Primary data were collected using a questionnaires which were administered to household heads. Key informant interviews were held with people who were considered to have in-depth understanding and knowledge on food security in the district. Thirteen key informants were purposively selected, including one District Agricultural, Irrigation and Cooperative Officer (DAICO), six villages and ward extension officers, three village government leaders and three Ward Executive Officers (WEOs). Twelve Focus Group Discussions (FGDs) were conducted in the 6 villages where the research was done (two FGD per village) with 8 to 10 villagers). The FGD participants were a mixture of old and young farmers, the youth and women, and villagers doing various activities. In this study, secondary information was collected through reviewing literature on the state of food insecurity in Tanzania and reports on the trend of food aid from Chamwino District Office.

3.4 Data Processing and Analysis

Qualitative and quantitative methods were employed to analyze the data that were collected. Qualitative data were analyzed by being summarized by their themes, and comparing and contrasting arguments given by different interviewees. Quantitative data were analysed using IBM SPSS Statistics Version 20 Software and Microsoft Excel software to compute descriptive statistics, frequencies, percentages, statistical means, and standard deviations of individual variables.

The multiple linear regression model that was used to determine the influence of contentious factors on food security in terms of dietary energy consumed per adult equivalent per day was as follows:

$$\gamma = a + \beta_1 \times_1 + \beta_2 \times_2 + \beta_3 \times_3 + .. + \beta_{12} \times_{12} + e$$

Where:
Y= Dietary Energy Consumed per adult equivalent per day (continuous variable)
a = Constant or intercept of the equation
$b_1 ... b_9$ = Regression coefficients,
e = Error term representing the proportion of the variance in the dependent variable that was unexplained by the regression equation.
X_1 = Household size (number of members), X_2 = Number of technologies used, X_3 = Income from non-farm income generating activities, X_4 = Monetary value of household assets, X_5 = Number of livestock, X_6 = Acreage (land cultivated in hectares), X_7 = Membership to financial institutions (1 = Yes, No = 0), X_8 = Education of household head (years of schooling), X_9 = High food prices (scores) and X_{10} = Low food supply (scores).

3.5 Adult Equivalent Units Computation

Dietary Energy Consumed (DEC) was expressed per adult equivalent following the procedure used by Collier *et al.* (1990). 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 (Table 1). 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 were taken into account by multiplying the adult equivalent units by the average cost (Table 1) 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.

3.6 Dietary Energy Consumed Computation

All food items consumed for 30 days were recorded. Quantities of dietary energy consumed in all the food items were computed based on Tanzania Food Composition Tables by Lukmanji *et al.* (2008). Dietary energy consumed was adjusted for the number of individuals in the household based on sex and age. Table 1 gives the adult equivalent scales that translate children into adult equivalents and also compare women and men.

The basis for such translation has mostly been the nutritional requirements of individuals by age and sex. Based on these adjustments, the quantities of DEC by all household members were expressed per adult equivalent units per day, based on all foodstuffs consumed for 30 days.

Table 1: 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	1.000	1.000
2	0.890	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)

3.7 Indicators used for Contentious Theoretical Factors Affecting Food Security

The response (dependent) variable for this research was food security in terms of Dietary Energy Consumed (DEC) per adult equivalent per day. The explanatory (independent) variables whose associations with food security were analyzed were: (i) household size which represented the pessimistic or Malthusian school of theory; (ii) use of agricultural technologies which was a proxy indicator of the optimistic or anti-Malthusian theory; (iii) amount of land cultivated, monetary values of household assets, livestock ownership and involvement in non-farm income generating activities which represented entitlement approach; (iv) illness of household head which represented family stress and (v) Institutions which included membership in financial institutions, years of schooling of household head and markets as indicators of Woldemeskel's composite theories. Markets were indicated by respondents' scores on food prices in nearby market places having affected food security or not, and respondents' scores on food availability in the nearby market places having affected food security or not. In Tanzania these indicators have been used by Kayunze *et al.* (2007) and Mende *et al*. (2015).

4.0 Results and Discussion

4.1 Indicators of theoretical determinants of food security

Household size was used as an indicator of population. The results showed that the mean household size was 5.9 persons with the minimum and maximum of 2 and 14 persons, respectively. The major technologies used in the study area were ox-plough, improved seeds and

pesticides. The results showed that the greatest proportion (62%) of the sampled households used one technology and about one-third (32%) did not use any technology while the rest of the respondents used two to three technologies (Table 2). This shows that use of technology is low in the study area. This is probably why during pair-wise ranking, which was done using the tool presented in Table 3; non-use of agricultural technologies was ranked as the biggest factor affecting food security.

Table 2: Total technologies used per household (n = 400)

Number of technologies	Frequency	Percent
0	128	32.0
1	248	62.0
2	23	5.8
3	1	0.2
Total	**400**	**100.0**

Non-farm income generating activities were used as an indicator of entitlement because it was expected that household involvement in income generating activities results in increased food security. The results showed that 39.5% of the sampled households were involved in non-farm income generating activities. Household assets ownership was used as an indicator of entitlement because they can be sold during food insecurity crises and get cash for buying food. The results showed that the average monetary value of assets owned was TZS 65,142 with minimum and maximum values of TZS 0.00 and TZS 5,150,000, respectively. Livestock ownership is a good entitlement for gaining access to food since livestock and their products are sold to get cash to buy food. Therefore, the study assessed ownership of livestock in the research area. The results showed that 12.8% of the households owned cattle; 10.8% owned goats; 32.5% owned chicken and 2.8% owned pigs. The average land cultivated in hectares was 2.55 with minimum and maximum amounts of 0.00 and 28 hectares, respectively. Membership in financial institutions was used as an indicator of institution. Membership to financial institutions enables members to access credit. Access to credit helps increase household income, food production, and hence, improved food security. The results showed that 2% of the households had individuals who were members in financial institutions. Years of schooling of household head was used as an indicator of institution because education attainment by the head of household could lead to awareness of the possible advantages of modernizing agriculture and diversification of household income sources, which in turn would enhance household's food supply. Results showed that the average years that household heads had gone to school were 5.2, the maximum and minimum years of schooling being zero and 13, respectively.

4.2 Extent to which Pessimistic, Optimistic, Entitlement and Composite Theories Explain Food Security in the Study Area

4.2.1 Qualitative influence of the theoretical factors on food security

The research involved a qualitative assessment of experiences of households which had food shortage any time during the previous 12 months. The qualitative assessment followed a procedure used previously by Kayunze *et al.* (2007) through a pair-wise ranking exercise that was based on the tool presented in Table 3 to gauge the extents.

Table 3. A pair-wise ranking tool used in the study

	1. Big household	2. High prices of food	3. Illness of household head	4. Lack of government support	5. Lack of income or assets	6. Decline in the average number of adults	7. Low food supply in the market	8. Lack of food exchange	9. Failure to use agricultural technologies
1. Big household									
2. High prices of food									
3. Illness of household head									
4. Lack of government support									
5. Lack of income or assets									
6. Decline in the average number of adults									
7. Low food supply in the market									
8. Lack of food exchange									
9. Failure to use agricultural technologies									

Table 3 contains major issues of contention according to pessimists (Malthusians), optimists (anti-Malthusians), Sen, family stress and Woldemeskel's composite theories. Each of the 9 contentious factors had equal chances of winning 0 to 8 times for every respondent. For example, big household size had the possibility of winning and appearing in all the un-shaded cells in the second row; failure to use agricultural technologies had the possibility of appearing in all the un-shaded cells of the last column; and lack of income or assets had the possibility of appearing four times in the sixth row and four times in the sixth column. For every household, the table was filled up with 36 choices in the 36 un-shaded cells. Since each of the 9 items had a possible maximum of being selected 8 times, the mean number of times they were selected (Table 4) are out of 8. Dividing each of the means by 8 and multiplying the result by 100, one obtains the numbers written in the last row of Table 4.

As Table 4 shows, therefore, the major factors that were perceived to have contributed to food shortage were high prices of food, lack of income or asset and failure to use agricultural technologies. Low food supply was a minor cause of food shortage. The qualitative assessment was used as a preliminary look at the factors and their contribution to food shortage.

Table 4: Extent to which contentious theoretical factors contributed to food shortage

Statistics	Big household	High prices of food	Illness of household head	Lack of government support	Lack of income or assets	Decline in the average number of adults	Low food supply in the market	Lack of food exchange	Failure to use agricultural technologies	Total
Mean extent scores out of 8	3.4	7.2	1.4	4.1	6.6	4.0	0.9	3.1	5.3	36
% (Over 100)	9.4	19.9	3.9	11.4	18.5	11.1	2.5	8.6	14.7	100

More empirical analysis was done using multiple linear regression whereby the dependent variable, food security in terms of dietary energy consumed per adult equivalent per day, was regressed on 12 independent variables (contentious factors) which were thought to account for more variation in household food security. The results of the regression analysis are presented in Table 5. The coefficient of determination, R^2, was 0.185 implying that the predictor variables explained 18.5% of the variation in the variance of the dependent variable that was food security in terms of dietary energy consumed per adult equivalent per day (Gujarati, 2004; Field, 2009).

Table 5: Influence of contentious theoretical factors on dietary energy consumed per adult equivalent per day

Predictors	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
(Constant)	2.828	0.144		19.613	0.000		
High food price	0.123	0.131	0.053	0.942	0.347	0.847	1.180
Number of livestock	0.000	0.001	0.019	0.343	0.732	0.869	1.151
Years of schooling of household head	0.005	0.003	0.115*	2.169	0.031	0.947	1.056
Membership in financial institutions	0.031	0.055	0.030	0.564	0.573	0.942	1.062
Household size	0.292	0.063	0.251***	4.606	0.000	0.896	1.116
Low food supply in the nearby market places	0.019	0.024	0.055	0.815	0.416	0.578	1.731
Non-farm income generating activities	0.054	0.022	0.135*	2.522	0.012	0.929	1.077
Acreage in hectares of land cultivated	0.074	0.028	0.151*	2.608	0.010	0.793	1.261
Number of technology	-0.016	0.014	-0.061	-1.124	0.262	0.900	1.111
Monetary value of household assets	1.036E-8	0.000	0.024	0.455	0.650	0.921	1.086
Chronic illness	0.032	0.025	0.085	1.303	0.194	0.629	1.589
disability of any household member	0.000	0.051	0.000	-0.010	0.992	0.964	1.037

Dependent variable: Dietary Energy Consumed per adult equivalent per day: R = 0.431, R^2 = 0.185, adjusted R^2 = 0.154, F statistics = 5.83, Durbin-Watson 1.735, ***significant at 0.1%, **significant at 1% and *significant at 5%

The other percentage was contributed by other variables which were not included in the model (Gujarati, 2004; Field, 2009). For social sciences such levels of coefficients of determination are reasonable unlike in natural sciences where higher levels of R^2 are needed. Using a linear regression analysis for determining influence of contentious theoretical factors on dietary energy consumed per adult equivalent per day, only household size, income from non-farm income generating activities, land cultivated and years of schooling were found to be significant (Table 5). The β-values tell us about the relationship between food security and each predictor (Field, 2009). If the value is positive there is a positive relationship between the predictor and food security, whereas a negative coefficient represents a negative relationship (Field, 2009). The results in Table 5 also show that, of the twelve contentious theoretical factors that affect food security, the most explanatory one was entitlement to food. Land cultivated in hectares showed a positive significant influence ($\beta = 0.151$; $p \leq 0.01$) on food security (Table 5). This can be interpreted that an increase of 1 hectare of land cultivated, with all other predictor variables being held constant, caused an increase in dietary energy consumed per adult per day by 0.151 kCal. This implies that the larger the land size cultivated the higher the household food security.

These results are in agreement with findings by Apanovich and Mazur (2018) who found that food security increased as land size cultivated increased. Income from non-farm income generating activities showed positive and significant influence ($\beta = 0.135$; $p \leq 0.01$) on food security. This means that an increase of TZS 1, all other predictor variables being held constant, caused an increase in dietary energy consumed per adult per day by 0.135 kCal. This implies that the more a household is involved in non-farm income generating activities the higher food secure is. This supports Sen's (1981) argument that food security is mainly explained by entitlements. During focus group discussions, the discussants reported that non-farm income generating activities were indicators of household food security. They enable farmers to modernize their production by giving them the opportunity for applying necessary inputs and reduce the risks of food shortage during periods of unexpected crop failure through food purchase (Frankenberger, 1992 cited by Agidew and Singh, 2018). Years of schooling of household head showed a positive and significant influence ($\beta = 0.115$; $p \leq 0.05$) on food security. This tells that an increase of 1 year of schooling, all other predictor variables being held constant, caused an increase in dietary energy consumed per adult per day by 0.115 kCal. This implies that the more the years of education the higher the household food security. Years of education of household head was in conformity with Woldemeskel's (1990) composite theories that institutional elements are important for food security. Household size showed a positive and significant influence ($\beta = 0.252$; $p \leq 0.01$) on food security. This implies that an increase of 1 member of household, all other predictor variables being held constant, caused an increase in dietary energy consumed per adult per day by 0.252kCal. This implies that, as household size gets larger, household food security increases. This result is contrary to Malthusian and neo-Malthusian contentions that population has negative influence on food security. The plausible explanation of that findings is that where households have economically active members who can contribute labour force to various farm and non-farm activities, increasing household size results in increased food security. The findings are in conformity with some previous researches elsewhere in Tanzania which have shown positive effect of household size on food security. For example, Kayunze (2000) found this in Mbeya Region; Matunga (2008) found this in Chamwino District; and Kamuzora (2001) found less poverty in larger households in Kagera Region. In all cases the plausible explanation for the findings was that it happens more where households have more

labour force in terms of bigger proportion of adult members who work either on farm or otherwise. Kayunze (2000) argues that in households with higher dependency ratio, or where households depend on one or a few members who are working, the bigger the household size the less the food security.

5.0 Conclusion and Recommendations

Based on the results above, it is concluded that the most important theory which explains food security in Chamwino District is entitlement in terms of income from income generating activities and land size cultivated. Therefore, it is recommended that promotion of income generating activities as alternative livelihood options should be pursued by both local and central government authorities in Tanzania, particularly in Chamwino District, to improve food security. Moreover, specific policies targeted at increasing access to land for agricultural production are needed to increase food security.

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