

## Socio-economic factors affecting food security in rural households of Bukoba district-Tanzania

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**Abstract:** As a basic need, issues of nutrition and food security have been a major discussion in many round tables held by organizations like FAO, WFP and governments around the world. The same has been the case in Tanzania. The purpose of this study was to find out how socio-economic, infrastructural, technological, socio-cultural factors affect food security of households in Bukoba District. The location of the study was Bukoba District in Tanzania. The study objectives were: to examine the effects of Socio-cultural factors

on household food security, to establish the effects of economic factors on household food security, to determine the effects of technological factors on household food security and to identify the effects of the infrastructural set up on household food security. This study was conducted using the descriptive research design. Data was collected from 150 households using structured standardized interview guides and focus group discussion. The study applied both primary and secondary data sources. Primary data was collected using a combination of standardized interview

guides and focus group discussion. The instruments were tested for reliability and validity by carrying out a pilot study. The secondary data were obtained from previously researched works such as thesis, academic journals, textbooks, government publications and internet/online sources. The data collected were processed through tabulation and tallying, thereafter coded and analysed by use of measures of central tendencies, dispersion, percentages as well as content analysis. The data were presented using tables and frequency distributions. This study found that socio-cultural, technological, economical and infrastructural factors influence rural household food security in Bukoba District. The specific socio-cultural factors influencing rural household food security included household size and perception of the residents on banana. Technologically, farmers in Bukoba district were seen to be below par as a majority of them used rudimentary tools such as *jembe* and *panga* instead of adopting the modern agricultural technology that foster increased output. Access to credit was a problem to most of the farmers in Bukoba since there were few credit institutions. Moreover the interest charged for the credit were too expensive for

most of the farmers. It was also observed that the district lacked the standard infrastructural platforms to support optimal food production. This study recommends that households in Bukoba District should adopt modern technology in order to boost food production. They should also diversify on the varieties of food consumed. The study also recommended that the authorities set up the necessary infrastructural facilities to boost the production of food in the district.

**Key Terms:** Food security, food insecurity, food access, socio-economic factors, rural households, infrastructural factors

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## INTRODUCTION

Achieving food security is a major concern for many households and governments in the world today. This situation has been exacerbated by key issues such as rising food prices as a result of reduced production, a shift of focus from growing food crops to cash crops, the global economic recession being faced by the global market, and the traditional challenges of inequitable access to factors of production by men and women. Malnutrition,

starvation, food shortages, and lack of safe foods remain significant global problems.

Breman (2004) states that “food security is one of the most urgent issues facing many states today”. This view is in tandem with Rupiya (2004), who observes that “the African continent is the only region in the world that has not been able to feed itself since the mid – 1970s and is unlikely to do so in the near future unless radical policy changes are made to current practice. As early as the year 2000, the number of undernourished people in sub-Saharan Africa was over 240 million (Food and Agricultural Organization, FAO, 2011). Bwalya (2013) states that, Africa is regarded as the most food-insecure continent in the world, and for many years it has continued to be a serious issue. In addition, between 2003 and 2005 about 30 percent of the population in sub-Saharan Africa was undernourished (FAO, 2008). It is also estimated that about 45 percent of those undernourished are less than 15 years old. The worst hit are children of less than 5 years who were stunted and underweight comprising 39 percent of the affected population (FAO, 2006). These escalating numbers are the primary reason as to why

hunger and food security must continue to be researched and addressed. A survey by the United Nations’ Human Development Report (UN, 2012) found that three in every four households in sub-Saharan Africa cannot access adequate food. Thus, achieving food security is therefore still a major challenge in the region. Consequently, it is unlikely that the MDG of halving the percentage of hunger by 2015 was achieved.

Barrett (2010) stated that the three main concepts of food security include availability, access and utilization which are in agreement with other many current researches that have been done. FAO reports that there is currently enough food produced worldwide to provide everyone with adequate calories (FAO, 2011). Therefore, in the global perspective, availability of food is not the core of the global food crisis.

Many research studies have been done in various countries in an effort to assess the status of food security and related factors. Knueppel, Demment and Kaiser (2009) conducted a study in Tanzania and found out that 48.1% of the population sampled was severely food insecure and that inadequate education levels have a direct link with high food insecurity. A

comparable study conducted by Rudolph, Kroll, Ruysenaar and Dlamini (2012) in Johannesburg, South Africa revealed that there was a strong relationship between socio-demographical factors (such as employment, income) and food insecurity. The aforementioned studies concluded that households comprising of people holding full-time jobs were more likely to be food secure as opposed to those household whose members had part-time jobs. The World Food Programme (WFP) (2012) comprehensive food security and vulnerability analysis report done in Tanzania also concurs with Rudolph et al., (2012) which posits that poverty, poorly educated, women headed households with high number of dependents' and households that rely on their own produced food are more food insecure among Tanzania's population.

In a survey conducted by the Tanzanian National Bureau of Statistics (TNBS), it was indicated that out of the twenty regions within the country, eleven experienced decline in food accessibility while only nine had moderate levels (TNBS, 2010). The eleven regions were inclusive of Kagera region where Bukoba district is

situated. The National Bureau of Statistics (2013) study indicated that over 50% of the population in Bukoba is food insecure. Similarly, the Belgium Technical Cooperation (BTC) Tanzania (2014) study revealed that only 12% of the households in Bukoba had three meals a day. Another study by World Food Programme (WFP) (2012) revealed that rural households were more food insecure than those in urban areas that the highest incidences of food insecurity were found among households whose income mostly came from crop production and a combination of agricultural incomes (World Food Programme (WFP), 2012).

From the background of this study, it is evident that statistics on food security situation among other studies have been conducted. From those research studies, it is evident that Bukoba district's food security situation is uncertain despite the numerous agricultural activities practiced in the area as well as having conducive weather and farm land. However, from the few mentioned researches that have been conducted no study has actually been carried out critically exploring factors affecting household food security and their relationships in Bukoba District; therefore, it is against this

background that this empirical study on the socio-economic factors affecting food security in rural households of Bukoba District, Tanzania was carried out. This subsequently validated the contribution to rural households' food insecurity.

White (2005) asserts that food insecurity remains one of the most critical challenges to economic development not only in the global context but also in rural communities and households in numerous countries, including Tanzania, specifically Bukoba population at 12% which remain food secure (Belgium Technical Cooperation, BTC, 2014). This study therefore sought to explore factors that affect food security in rural areas of Bukoba District because failure to look into such factors may further exacerbate the struggle against food insecurity amongst households in the aforementioned district. It is envisaged that identification and understanding of these factors and their influence on food security would help propose strategies to increase food security. Recommendations to address policy weaknesses and failures of food security may assist in reducing these susceptibilities in the area.

### **Objectives of the Study**

The main objective of the study was to explore the various factors that are behind the food security situation in rural areas of Bukoba District.

The following were specific objectives that guide this study;

- i) To identify the influence of socio-cultural factors on house hold food security in Bukoba District.
- ii) To examine the influence of infrastructural factors on house hold food security in Bukoba District.
- iii) To find out the influence of economic factors on house hold food security in Bukoba District.
- vi). To determine the influence of technological factors on house hold food security in Bukoba District.

### **Research Questions**

The study sought to answer to the following questions:

- i) How do socio-cultural factors affect house hold food security in Bukoba District?
- ii) What is the influence of infrastructural factors on house hold food security in Bukoba District?
- iii) How do economic factors affect house hold food security in Bukoba District?
- iv) What is the influence of technological factors on house hold food security in Bukoba District?

## **MATERIALS AND METHODS**

This study used descriptive survey to determine the factors influencing rural households' food security in Bukoba District. The research design for this study was a descriptive research study which was analysed through qualitative approaches. A descriptive research seeks to describe a unit (a case) in detail, in context and holistically. It allowed an in-depth investigation of the problem at hand (Kombo and Tromp, 2006).

The study adopted both quantitative and qualitative approaches of data collection so as to present a more coherent picture of this unique case of rural household food security in Bukoba. Also, a descriptive study

research design had an advantage over any other design in this particular case since it aimed at understanding human beings in a social setting by interpreting their actions, behaviours, attitudes, habits, opinions and a variety of social issues. This was done through conducting focus group discussions with some residents of Bukoba District.

During the study, the patterns, trends and relationships from the gathered information were sought. The research employed stratified sampling procedures so that useful generalizations and recommendations would be extended to other individuals, communities or groups. The current study was thus guided by four research questions. A combination of data collection methods was selected for this study in anticipation of providing a more complete picture of the problem under study.

This study dealt with a homogenous population i.e. the households of Bukoba district from the following villages (Bukungo, Butainamwa, Itongo, Kilima, Mikoni, Itahwa villages, Ntoija, Ibwera, Butairuka and Kasharu). The target population in this study was households in rural Bukoba District. According to Bukoba

District records there were two thousand households which was the focus of this study.

The sample size for the households in this study was determined using the formula below:

$$n = \frac{Z^2 N \cdot \pi \cdot (1 - \pi)}{(N - 1) \cdot \varepsilon^2 \cdot \pi^2 + Z^2 \cdot \pi \cdot (1 - \pi)}$$

n = minimum size of the sample.

N = is the total population in which the sample should be drawn (The population is 2000)

Z = is drawn from a normal rule of quantity, under the assumption of data that is normally distributed. For an interval of confidence up to 95% (it means that for one threshold  $\alpha = 5\%$ ), Z is of 1.96.

$\varepsilon$  is the wanted accuracy by the study, matching with the error margins judged acceptable. Regarding this research,  $\varepsilon$  is taken to be equal to 5%.

The summing up shows that the size is directly proportional to the quantity  $\pi(1 - \pi)$

$\pi = 0.5$  (it means  $1 - \pi = 0.5$ ) gives the most elevated variance consequently leading to the most elevated size).

The study can then be allowed to use  $\pi = 0.5$ :

$$n = \frac{1.96^2 (2000) \cdot 0.5(1 - 0.5)}{(2000 - 1) \cdot 0.05^2 \cdot 0.5^2 + 1.96^2 \cdot 0.5(1 - 0.5)} = 200$$

Stratified sampling was used to group the households into 10 sub-groups based on the administrative villages. From each of these villages, twenty households were randomly selected for the study. The interviews and focus group discussion techniques were used to collect data from the respondents. The standardized interview guides comprised of both open-ended and closed-ended questions. The questions in the instruments were discussed with the supervisor and other research experts to as to obtain the validity.

The raw data that were collected were systematically organized in order to carry out data analysis. The instruments were categorized and the information tallied and summarized so as to obtain the descriptive statistics i.e. frequencies and percentages to describe the sample. The data

from the standardized interview guides were analysed as per the research questions of the study. The data were analysed using the IBM Statistical Package for Social scientists (SPSS®).

Validity was ensured by having objective questions included in the standardized interview guides. This was achieved by pre-testing the instrument to be used to identify and change any ambiguous questions and techniques. This helped in making the inferences based on the current findings accurate and meaningful. A pilot study was carried out as a technique for testing the validity of the data collection instruments specifically the standardized interview guides and focus group discussion items. A sample of 20 respondents were selected from the neighbouring villages for piloting purposes. Piloting helped to identify any unforeseen limitations that could adversely affect the results of the findings of this study.

To assess reliability of the data, the test-retest method was administered. The same instrument was applied twice to the same group of subjects (after seven days). Then, the findings were correlated the scores from both testing periods. Having attained a

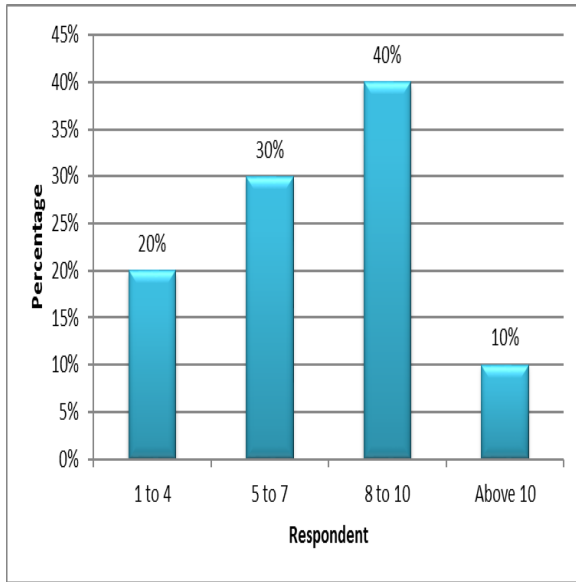
high ‘coefficient of reliability’, the instrument was then considered appropriate for the research. As per the ethical issues in the research, the respondents were made aware of the nature of the research and their role before they agreed to take part in it. The nature of the study was explained to them with the guarantee of anonymity in the thesis.

## **Results and Discussions**

### **The socio-cultural factors affecting rural household food security**

In order to achieve the above-mentioned objective, the respondents were asked a series of questions that would address the indicators to the variable on socio-cultural factors. It is in this light that the study sought to determine the average number of individuals per households. The findings are shown in Figure 1 below.

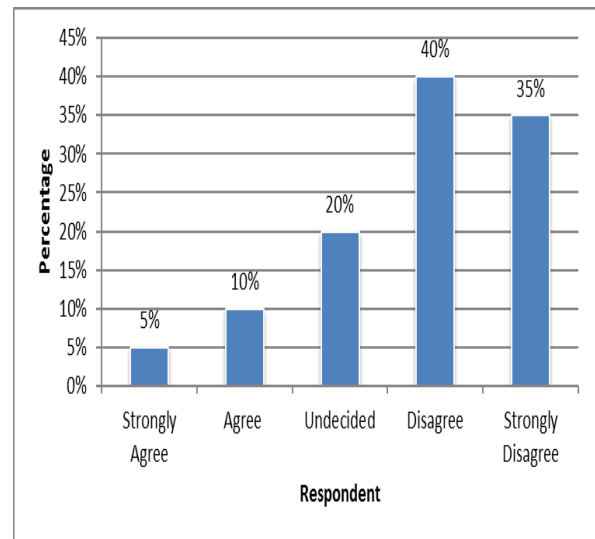




**Figure 1: Number of members in respondents’ household**

The findings revealed that majority of the respondents had 8-10 members in the household (40%) followed by 30% who had between 5-7 people in the family, 20% of the respondents had 1-4 people in the family while 10% of the respondents had above 10 people in the family. When a household is large then more resources are likely to be needed to meet the needs of its members. This implies that more resources are required to secure food for household members. As Pinto (2001) observed, larger households are at a risk of facing food insecurity since more pressure is likely to be created on the scarcely available resources.

The study sought to find out whether the residents of Bukoba district were able to ensure food security for their families. The respondents were therefore asked, on a likert scale, state how comfortable they were in meeting the dietary needs of their households. The findings were as shown in Figure 2 below.

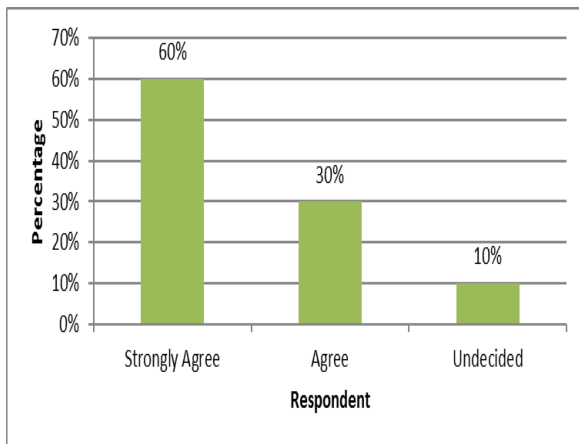


**Figure 2: Respondents’ views on their Capacity to meet their household’s dietary needs**

As per figure 2 above, majority of the respondents disagreed with the statement that they were able to sufficiently ensure food security to the family (40%). This was followed by 35% of the respondents strongly disagreeing. 20% of the respondents were undecided, 10% agreed while 5% strongly

agreed. This findings concur with the position taken by BTC (2013) which posits that out that only 12% of the Bukoba residents can afford three meals a day. This implies that majority of the households in Bukoba are food insecure.

The study sought interrogate some of the cultural beliefs that dictate the dietary preferences of the residents in Bukoba District. The respondents’ views on the statement ‘without eating banana they did not feel like having eaten’ were solicited. The findings were as shown in Figure 3 below.



**Figure 3: Respondents’ views on Meals without Banana**

From figure three above, the findings revealed that majority (60%) of the respondents strongly felt that without

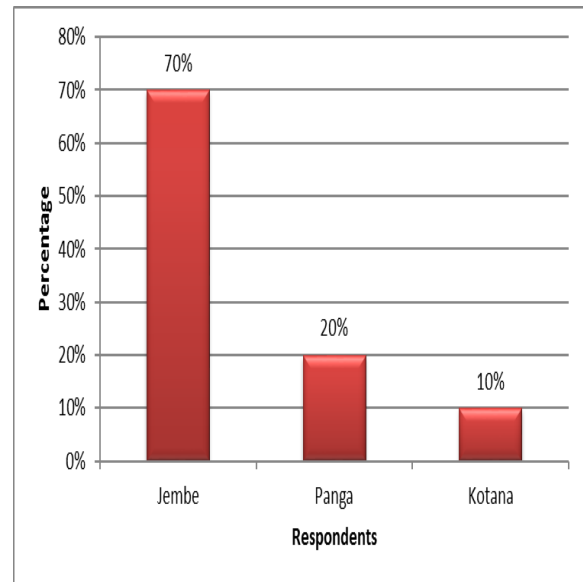
banana as part of the meal, they felt that they had not eaten, 30% agreed, while 10% of the respondents were undecided. Mauro, Benjamin, Gero, and Kathleen (2005) advocate for the involvement of the people and their traditions rather than debase them through forcing them to eat food that is culturally unacceptable. Therefore, in the cultural setting of the Bahaya people, banana is the most appreciated and valued food. This implied that scarcity of banana meant household food insecurity even if other types of food were readily available.

On the same note, the study sought to find out whether respondents could produce other crops instead of banana. The findings show that 50% of the respondents strongly disagreed that they could not produce other types of food before producing this type, 20% disagreed while 20% were undecided. Those in agreement as well as those who were in strong disagreement each made up 5% of the total responses. The production of different types of food crops may help ensure food security since their maturity and utilisation may occur at different times of the year and more so households get a variety of options to choose from (Billy, 2012). Therefore being

able to produce other types of food ensures household food security. The above findings are in inverse to what is observed in Bukoba where the strict production of banana meant limited variety and supply of food.

### **Technological factors affecting rural household food security**

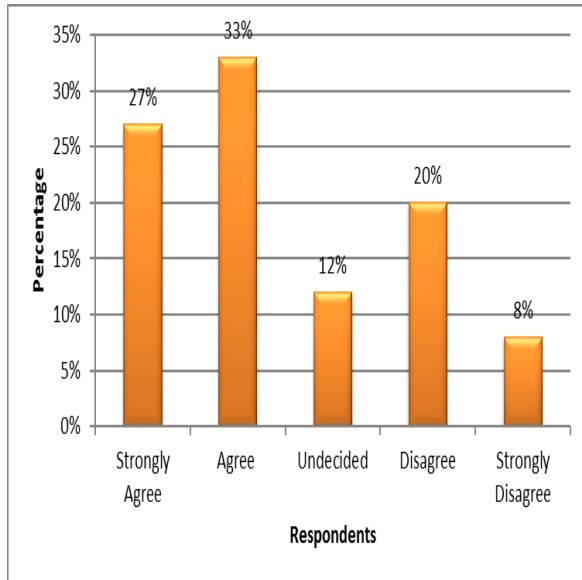
Technology is one of the most important factors that determine the output in agriculture. This is because it works towards increasing the efficiency in production. This study sought to determine the technological factors influencing household food insecurity in Bukoba District. In order to achieve this, the respondents were asked the types of tools they use in their farms. The findings for the study are presented in Figure 9 below.



**Figure 9: Types of tools used by farmers in Bukoba District**

From the findings of the study, 70% of the respondents used jembe, 20% of used panga while 10% used kotana. This therefore shows that the community still lagged behind in the adoption fo modern technologies. (Asenga, 2001) hence argues use of primary tools lowers the efficiency and consequently lowers farm output. This make the households to be food insecure. Technology being a key factor in food production, this study sought to determine what specific aspects under this variable influenced household food insecurity in Bukoba District. In order to achieve this, the respondents were asked if their levels of technology they adopted on their farms

affected food production. The findings were as shown in Figure 9 below.



**Figure 9: The effect of Technology on Food Production**

The findings showed that 33% of the respondents agreed that technology had an effect on the levels of food production, 27% strongly agreed, 20% disagreed, 12% were undecided while 8% strongly disagreed. Most rural households lacked adequate information and financial capacity that was necessary for the adoption of advanced farming methods (Ayub, 2000). This case was replicated among households in Bukoba District where the majority of the farmers do not have or use advanced farming methods. In terms of the aspect of adopting modern

technology, the study also sought to find out the uptake was in Bukoba District. The respondents were therefore asked if they used modern technology in their farms. The findings revealed that 70% of the respondents said they had never used modern technology in their farm while 30% said they did. This implies that the majority of the households did not use modern technology in their farm. Tjan (1999) observed that farmers in the rural settings were a rather slow in the adoption and integration of modern farming technology. The reasons that are once again attributed to this state of affairs are the lack of financial resources and adequate information needed to secure such technologies.

### **Economic factors affecting rural household food security**

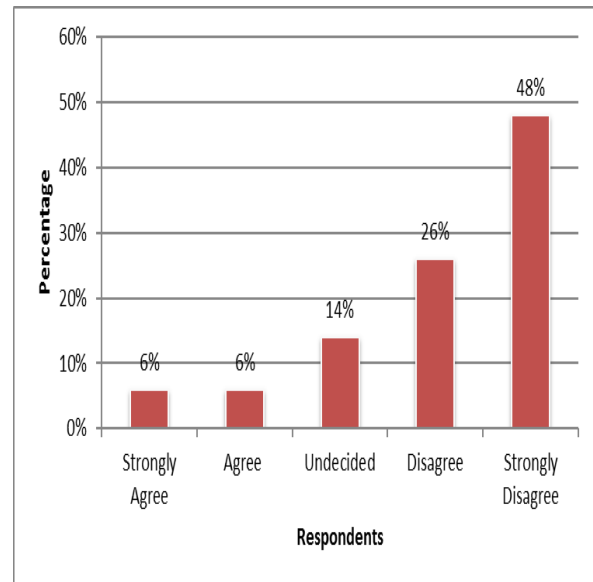
#### **Access to Resources to Purchase Food**

The study sought to find out whether farmers had sufficient resources to secure food for their families. From the responses, it was observed that 80% of the respondents did not have enough resources for this while 20% of the respondents said they had enough resources. Hence a majority of the households did not have adequate financial

capacity to ensure that they could feed their families. This findings above are consistent with the revelations of the World Bank (2012) survey that pointed to the fact that majority of the people living in sub-Saharan Africa live on less than two dollars a day thus a similar case replicated for a majority of the population in Bukoba.

### Access to Credit for Farm Cultivation

Access to credit for faming purposes is a critical factor when it comes to the growth of agriculture in any economy. This can either take the form of subsidies or direct finance investments. The availability of such plays a critical role in the fight against food insecurity. The study sought to determine whether farmers in Bukoba could easily access credit for cultivating their farm. With the following question put forth to the farmers, the findings were as shown in Figure 10 below.



**Figure 10: Ease of Access to Credit Facilities by Farmers**

The findings revealed that 48% of the respondents strongly disagreed to the statement that they could easily access credit to cultivate their farms, 26% disagreed, 14% were undecided, 6% agreed and 6% strongly disagreed. One of the prerequisites to economic wellness is the access to credit since it bestowed one with opportunity to attain working capital that is capable of generating income or rather increase it. However, Odudo (2011) identified access to credit as a major socio-economic challenge to rural socio-economic development. This was because most of the rural residents to not have adequate security to meet the credit. The study, on seeking to find out the

availability and adequacy of credit institutions for farmers in Bukoba district found out that 35% of the respondents mentioned that they were insufficient. 33% mentioned that they were heavily insufficient, 18% of the respondents were undecided, 10% of the respondents found them sufficient while those who found them sufficient as well as very sufficient each accounted for 6 % of the respondents.

The sparse presence of credit facilities has been noted by a number of rural development oriented studies (Mobidy, 2003; Tolin, 2006). This could be attributed to various factors such as the lack of viable economic activities, low level of productivity and lack of adequate information on credit facilities among the rural households. Hence this failure negatively impact on household food insecurity.

Within the same aspect of access to credit, the study also sought to determine the attitude towards the bureaucratic processes involved in the acquisition of credit for farmers. The finding showed that 78% of the respondents said the procedure for acquiring credit was rigorous thus a negative attitude while 22% of the respondents said the

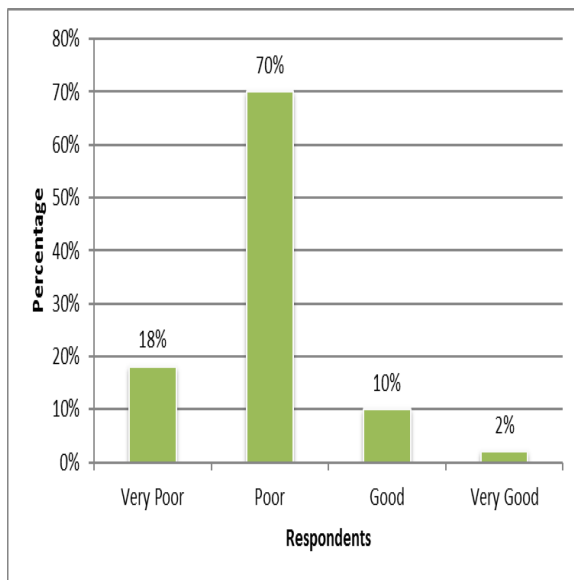
procedure was not rigorous thus a positive attitude. Due to the credit risks associated with advancing credit to the rural households, credit institutions do come up with certain procedures to minimise credit risks. Such procedures may make access to credit cumbersome for majority of the rural household (Furay, 2001). This therefore goes to show that in as much as the financial institutions may be available, the threshold and requirements to secure credit may be beyond the farmer's capabilities.

For the farmers who were able to gain access to the credit facilities, the study sought to find out whether interests for loan repayment rates were high for them. The findings showed that 62% of the respondents agreed to the interests for repaying the loans being quite high, 23% strongly agreed, 5% were undecided, 5% disagreed while 5% strongly disagreed to this position. For the majority of the households the loan repaying interest was high. The study by Finlay (2010) also found out that most farmers in the rural areas of developing economies do not access credit for the purposes of crop cultivation due to high interest rates. A similar case of therefore present in Bukoba where households cannot access credit for

farming due to high interest rates associated with acquiring credit.

### **Infrastructural factors influencing household food security**

The aspect of infrastructure is key to the growth and development of the agricultural sector. It was therefore selected as one of the objectives of study. The respondents were asked to rate the state of the roads in Bukoba District. The findings were summarized as shown in Figure 11 below.



**Figure 11: The state of roads in Bukoba**

The state of the roads in Bukoba were rated by 70% of the respondents as being poor, with 18% rating them as being

very poor, 10% said the roads were good while 2% of the respondents said the roads were very good. Infrastructural development has been seen to be the most pressing issue when it comes to socio-economic development in the rural areas and hence household food security (Morrison, 2000). Good road networks ensure faster and convenient means of transport that is also affordable. Therefore lack of accessible roads leads to household food insecurity.

In addition, the study sought to determine the accessibility of the market places in terms of distance from the respondents' homes/farms. The findings indicated that 60% of the respondents found the facilities as being far from them while 40% felt that the centres were not far. Market centres play an important role in the socio-economic development of a given area and hence household food security. Pinto and Pius (2003) noted that a serious challenge to food security in the rural households is the lack of ready market for the farm produce. When market centres are far, most of the farm produce does not reach there in good condition thus a lot of it ends up as waste. This translates to double-loss in that the farmers makes a loss in investments.

There also is short supply of the commodity thus would be availed by the consumer at a high cost impacting negatively on household food security.

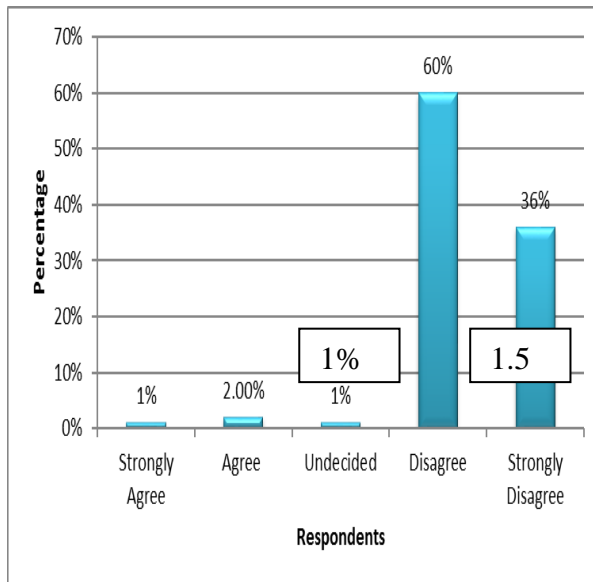
The access to basic facilities at the market place are essential for the optimization of trade and movement of agricultural commodities. The study therefore sought to determine whether the market centres were sufficiently equipped with proper infrastructure such as shades, toilet facilities and garbage collection points. The findings showed that 78% of the respondents mentioned that the market centres were not sufficiently equipped infrastructure-wise. 22% strongly agreed on the same. Due to lack of adequate resources most of the local authorities have not established market centres on such facilities. These have an impact on the market activities during the rainy seasons where these trading centres end up being closed due to the flooding of the market centres (Henry et al, 2005).

As for the case of well adequate and passable roads to the market, the findings revealed that a majority of the respondents (43%) mentioned that they fell below standard. This category was followed by

33% who felt that these roads were in poor condition. 12% mentioned that they were good, 7% were undecided while 5% of the respondents strongly felt that the roads were in good shape. Poor infrastructural development such as poor road networks has remained a major challenge to the rural households especially in the developing countries (Gordon, 2004). This therefore, implies that poor road network in Bukoba affects distribution of food to the household leading to household food insecurity.

Access to information about the various on-goings in the market such as updates on the cost of various commodities are invaluable to agricultural commerce. The study sought to determine the ease of access to market information. The findings were as shown in Figure 12 below.





**Figure 12: Ease of getting market information**

The findings above showed that majority of the respondents (60%) disagreed with the statement that there was ease of getting market information, 36% strongly disagreed, 1.5% were undecided, 1.5% agreed while 1% strongly agreed. This position was in tandem with what Rubager (2010) posits that most of the rural households in the developing economies are characterised by low level of education, poverty and social exclusion. This has the effect of impacting negatively on access to latest market information. As a result most of the rural households are taken advantage of by the middle men (brokers) who end up

exploiting them due to their lack of information.

### Analysis from focus group discussion

From the focus group discussion the study found out that majority of the households did not have enough food. The socio-cultural reasons that they cited included over dependence on banana. This had made the households to produce a particular type of food i.e. banana making the production of other food crops to be done at a relatively low scale. A majority of the respondents said that other types of food they consume included; arrow roots, pumpkins, cassava, sweet potatoes, and beans. However, these were not produced in bulk since they were given footnote status when compared to banana. This finding concurred with the position taken by Mauro, Benjamin, Gero, and Kathleen (2005) who advocate for the involvement of the people and their traditions rather than debase them through forcing them to eat food that is culturally unacceptable. Therefore, in the cultural setting of the Bahaya people, banana is the most culturally appreciated and valued food. This implied that scarcity of banana meant household food insecurity even if other types of food were readily

available; since the consumption pattern is more of banana oriented.

On the technological factors affecting rural household food security, the general position taken was that the use modern technology in their farms was very low. They listed the tools that they use in their farms such as; jembe, panga and sickle among others. The reason for the choice of the tools was because the types of Striga weed (*Striga hermotrithical*) that goes ten inches deep hence could only be best removed on using jembes and pangas. The type of manure that households used during cultivation was farm yard that was made out of a mixture of chopped green leaves and animal droppings that was covered for ten days in a hole/pit. Mulching was also used to conserve the moisture and provide nutrients to the soil upon decomposition. This made it difficult to adopt modern technology in the farms. The findings of the study concur with that of Oladeebo and Sanusi (2004) who found out that the major challenge to food security in Africa is its underdeveloped agricultural sector that is characterized by over-reliance on primary agriculture.

With regards to economic factors affecting rural household food security, a majority of the respondents said that they were not able to provide adequate food for their families. Most of the households could not get access to credit due to high interest rates coupled by few numbers of credit institutions. Most of the respondents mentioned that they do not get access to credit since they do not even have bank accounts. Furthermore, lack of adequate land for crop cultivation was also cited by the respondents. Viable procurement of food must be consistent with the satisfaction of other basic material and non-material needs (Payne and Limpton, 2008). Sasuni and Adesiyani (2007) observed that farm holdings were generally small with less than 5 hectares on average and were often inherited rather than purchased. Therefore, inadequate resources among residents of Bukoba District render them food insecure at the household level.

On infrastructural factors affecting rural household food security, majority of the respondents stated that they do not have good road networks, the market centres were not established on permanent structures, few roads led to the market centres and their

conditions were poor. Simmonds (2006) observes that poor infrastructure and barriers in penetrating the market caused by their limited resource base, lack of information, lack of or inadequate support institutions and poor policies in place among other factors compromise food security. Poor infrastructure literally limits the markets to which farmers can profitably take their produce by increasing the cost of transportation, and hence also acts as a barrier to market penetration. In the case of Bukoba District, infrastructural factors have led to poor road networks that have impacted negatively on the accessibility to the market. This has in turn led to household food insecurity due to cost of transportation and delay in getting market information.

### Regression analysis

Regression analysis was used to investigate the influence of the selected factors on food security. The analyses are as shown in the following tables.

Table 1: Model Summary

<b>Model Summary</b>				
<b>Model</b>	<b>R</b>	<b>R Square</b>	<b>Adjusted R Square</b>	<b>Std. Error of the Estimate</b>
1	.963 <sup>a</sup>	.927	.922	.280

a. Predictors: (Constant), Socio-economic factors; Technological factors; Economic factors; Infrastructural factors

From Table 1 above showing model summary of data, the R value of 96.3% showed that there is a very strong relationship between the independent variables and the dependent variable. The R square shows a high goodness-of-fit, the value of 92.7% of the variance in the dependent variable is explained by the independent variables in the model i.e. 92.7% of the variability in the food security. The remaining 7.3% explained at the stochastic error term could be attributed to the random fluctuation on other unspecified variables.

Table 2: ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	138.229	10	13.823	176.112	.000 <sup>b</sup>
Residual	10.832	13	.833		
Total	149.060	14			

a. Dependent Variable: Food security

b. Predictors: (Constant), Socio-economic factors; Technological factors; Economic factors; Infrastructural factors

The ANOVA in table 2 above describes the overall variance accounted for in the model. The F statistics tests whether the expected values of the regression coefficients are equal to each other and that they equal zero. A large value of F (176.112) and a small significance level ( $P < .000$ ) two tailed, indicate that the four predictor variables (independent) are not equal to each other and can be used to predict the dependent variable food security.

Table 3: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.401	.332		1.208	.229
No. of family members (Socio-cultural)	.095	.077	.090	1.231	.230
Without eating banana I don't feel like having eaten (Socio-cultural)	-.327	.106	-.235	-3.075	.003
farmers in Bukoba district do not use advance farming method/inputs on their farms (Technological)	.249	.072	.315	3.475	.001
do you agree that better-quality farm inputs in your area that are easily available (Technological)	.160	.096	.175	1.670	.097

in your opinion use of technology may lead to increased food production( <b>Technological</b> )	.087	.031	.084	2.795	.06
do you have enough resources to secure enough food for your family( <b>Economic</b> )	-.295	.108	-.124	-2.725	.07
farmers in Bukoba can easily access credit for cultivating my farm( <b>Economic</b> )	.215	.088	.256	2.442	.06
Interests for loan repayment are quite high for most of the farmers ( <b>Economic</b> )	.025	.048	.024	.523	.62
There are adequate and passable roads to the market( <b>Infrastructural</b> )	.036	.080	.042	.442	.659
I easily get timely market information( <b>Infrastructural</b> )	.413	.072	.272	5.703	.00

a. Dependent Variable: food security

The table above (3) provides the influence of individual predictor variables on the dependent variable. The coefficients indicate the increase in the value of the dependent variable for each unit increase in the predictor variable. The standardized coefficient or beta column provides a common scale (Z score; all variables have a mean of zero and a standard deviation of one and are expressed in the same unit of measurement). These values give the following regression model:

$$Y = 0.401 + 0.315T + 0.272P - 0.235SC + \epsilon$$

Where:

Y = Food security

T = Technological factors

P= Infrastructural factors

SC= Social cultural factors

$\epsilon$  = Error term

The regression model indicates a positive relationship between food security and technological factors, infrastructural factors and a negative relationship with social cultural factors. Hence, a unit increase technology, infrastructural causes a 31.5%,

27.2% increases in food security respectively. On the other hand, socio-cultural factors which show a negative relationship indicates that a unit increase in socio-cultural factors causes a 23.5% decrease food security. Therefore, it is important to pay more attention to technological and infrastructural factors (in that order) in order to become more food secure. The economic factors were not significant as per this study. The results of this study for example, on socio-cultural factors contract Mauro et al. (2005) who support the notion of always taking the indigenous food culture and food production pattern of a society as a starting point for optimal nutritional conditions. Infrastructural factors are important and the results agree with previous research such as Osman (2003) who says that main and feeder roads that improve access to necessary input fertilizer, seed, pesticide chemicals and other agricultural implements are very indispensable.

### **Conclusion**

Based on the findings, this study concluded that level of monthly income had negative significance on household food security in Bukoba District. This is because

majority of the households had little income to cushion them against risks of food shortage during periods of unexpected crop failures. High income-earners are able to meet their basic needs such as; food, shelter and water. Households of low income earners are therefore likely to experience constraints when it comes to accessibility of food especially during the low food supply seasons. Hence the number of meals depended on income of the households. The markets inaccessibility had significant negative effects resulting to reduced agricultural productivity. Most of the farm products may go bad when they don't reach the market in good time. Farmers may also get demoralized when they do not get the value of their investments due to poor infrastructure. The modern farming technologies lead to increased production for household consumption and profits. However, most of the households in Bukoba did not use modern technology in their farms. This had significant influence on food security. The socio-cultural factors had a great influence on this too. The size of the house hold had negative influence on food security as increased household size resulted in increased demand for food. This demand, however cannot be matched with the

existing food supply from domestic production and this ultimately end up with the household becoming food insecure.

### **Recommendations**

This study recommended that the government of Tanzania work together with the line NGOs so as to create programmes that might help change the perception of the residents of Bukoba District to embrace other types of food by producing them and consuming as well. This may help reduce the constraint on banana and other resources while at the same time ensuring a healthy and productive population.

The residents of Bukoba should embrace new technology as this will ensure improved farm productivity hence rural household food security in Bukoba District. The farmers in Bukoba District should also ensure that they devise ways and means of obtaining market information so as to get value for their effort and investments.

### **Suggestions for further studies**

Due to the limitation of time, and resources this study could not be carried out in all the districts in Tanzania. Therefore, it is suggested that a study be carried out in all

the rural districts in Tanzania so as to determine the factors influence rural household food security. Another study should be carried out to determine the extent to which each of the factors highlighted in this study influence rural household food security.

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