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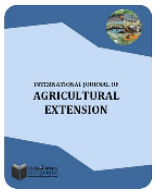

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# LIVELIHOOD OPTIONS AND FOOD INSECURITY IN MARGINAL AND SEMI ARID AREAS OF SAME DISTRICT, TANZANIA

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**A B S T R A C T**

In semi-arid areas of Tanzania, communities face problems of food insecurity, but little is known about food insecurity and coping strategies in the semi-arid areas. This paper aims to identifying livelihood options and the most common type of food insecurity in the study area, levels of the most common type of food insecurity, and coping strategies underlying the food insecurity as well as socio-economic factors underlying effectiveness of the key coping strategy. The study was carried out in four villages namely Njoro, Ishinde, Mabilioni and Saweni located in Same district. Data was collected using Participatory Rural Appraisal techniques, discussion with key informants, structured questionnaire and participant observation. Qualitative data were analyzed using content analysis technique while descriptive and inferential statistical analyses were employed to analyze quantitative data. Both chronic and seasonal food insecurity occurs in the study area, whereby chronic food insecurity seems to be the most common type occurring among households. Three levels of household chronic food insecurity exists in the study area namely severe food insecurity, moderate food insecurity and mild food insecurity. The common coping strategies in order of importance were: casual labour, petty business, remittances, and temporary migration. Casual labour was found to be key coping strategy in the study area. Age of the household head and family size significantly enabled effectiveness of casual labour while sex of the household head significantly constrained effectiveness of casual labour as a key coping strategy against food insecurity. The study concludes that in the semi arid areas coupled with the vagaries of weather households, especially the poor continuously depend more on non-natural resource based copping strategies as opposed to the general understanding that rural households draw their livelihood from faming and natural resources surrounding them. The study recommends use of different interventions to arrest the food insecurities but more non-natural resources based strategies should be used in order to improve household food security such include establishment of small scale agro-industries and provision of other off-farm income opportunities for poor households and the need for considering household's socioeconomic characteristics in food security management programs..

**Keywords**: Livelihoods, Food Insecurity, Forest.

## INTRODUCTION

An estimated 38% of the population of sub-Saharan Africa (SSA) (roughly 260 million people), Tanzania inclusive, live in drought prone dry-lands (Rockstrom, 2000). Tanzania's main economic stay is agricultural production, which supports over 33 million people and provides 84 percent of rural employment (URT, 2006). Nearly two thirds of Tanzania with a total area of 939,701 km$^2$ can be described as semiarid on the basis of having less than 25% probability of receiving 750 mm of rainfall per year (Bourn and Blench, 1999). The livelihoods of most people in these areas still is believed to depend on agriculture or direct utilization of natural resources surrounding them. The semi-arid circumstances impact negatively on the level of the natural resources availability (Yanda and Shishira, 2001). The resource-poor lowlands of Same district are in the semi-arid areas with limited livelihood options. The differential availability of natural resources is

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accompanied with some forms of exclusion on the basis of wealth, gender and ethnicity (Mbeyale, 2009). The livelihood of the rural poor who lack access to natural and other forms of capitals are challenged on many fronts: most important is food insecurity (Baumann, 2002).

Food insecurity in developing countries like Tanzania and particularly in the study area is tied up with natural resource scarcity and exists when people lack sustainable physical or economic access to enough safe, nutritious, and socially acceptable food for a healthy and productive life at all times (FAO, 1998). Food insecurity may be chronic, seasonal, or temporary, and it may occur at the household or national level. Food insecurity in most rural areas is associated with marginal land ownership, dependency of wage labour, water scarcity for irrigation, degradation of cultivable land, loss of farm and off-farm jobs, indebtedness to local money lenders, social instability and price fluctuation of necessary commodities are some of the main risk factors of food insecurity at the household level (Arun and Clark, 1999).

Under such circumstances, households try to device means of coping with the change. This is by constructing a diverse portfolio of activities and income sources in order to survive and to improve their standard of living i.e. coping. For that reason, coping strategies are those means which absorb the impact of an adverse shock by drawing down assets and reducing consumption (Davies, 1996). Coping is practiced in anticipation of, and in response to, risky events and outcomes (Siegel and Alwang, 1999). Narayan *et al.,* (2000) lists six basic strategies: piece work, petty business, changes in diet, fewer meals, loans from traders, and selling cattle. It is difficult to generalize about coping strategies in response to food insecurity. The strategies are at best site specific and when ineffective, vulnerability of marginal groups is increased. It is therefore critical to verify and screen the adaptation options in a particular situation to generate relevant information by documenting how different households cope when the food security is threatened in resource poor areas so that appropriate policies may be formulated. Semi-arid areas of Sub-Saharan Africa (SSA) where drought is the most critical constraint to development, critical manifestations of poverty such as food and income insecurity are apparent. The proportion of households in the rural areas of Tanzania that suffer from food insecurity is as high as 77% (Kavishe and Mushi, 1993). In response to this, the number of people who needed food assistance in the country raised from 1.9 million people in 2003 to 4.1 million people by 2004 including 1.09 million people mainly in semi-arid regions of Tanzania (Tanzania Red Cross National Society, 2004).

Tanzanians' semi-arid environments are risky environments from the perspectives of those who depend upon the natural resource base for their livelihoods in which communities face problem of food insecurity (Yanda and Shishira, 2001). The livelihoods of most rural households in these areas depend on subsistence production and also on the natural resource base including; irrigable land, forests and grazing land to support their livelihood in which food security is vital (Morris *et. al.,* 2003). Moreover, productivity of the scarce natural resources in these areas is coming under stress due to climate change. Rainfall patterns in semiarid areas are unpredictable contributing to risk and uncertainties of agricultural production in semi-arid areas, and long-term temporal trends are weak or non-existent (Mahoo *et al.,* 1999). Apart from the constraining biophysical conditions in semi-arid regions, access to different livelihood options is constrained by unequal power relations, conflicts and exclusion of some community groups such as women, small scale farming communities and livestock keepers (Mbeyale, 2009). However, to insure food security, rural households still depend on these scarce natural resources as their means of coping against food shortage. This implies coping strategies against food insecurity are becoming increasingly crucial to most community members.

While a number of scholars examined factors affecting food security at household and national levels (Kayunze and Salisali 2006; Koda, 2002; Keenja, 2001; Ishengoma, 1998), less research works have assessed types of food insecurity, coping strategies against food insecurity and socio-economic factors underlying the effectiveness of coping strategies among households in resource-poor semi-arid lowlands of Same District. Therefore, this study aimed to fill this knowledge gap.

## STUDY AREA AND METHODS FOR DATA COLLECTION

**Location:** The research was carried out in the semiarid lowlands of Same district. The district is one of the six districts of the Kilimanjaro region in Tanzania. It is bordered to the north by Mwanga district, to the northeast by Kenya, to the south and southeast by Tanga region and to the west by the Manyara region. The study was conducted in lowland semi-arid zone of Same

District, Kilimanjaro region. The area lies between $4^0$S and $4^0$45'Sand between $37^0$30' E and $38^0$15' E. The research involved four villages: Njoro, Ishinde, Mabilioni and Saweni (Figure 1).

Administratively the district is divided into 6 divisions and has 25wards with the total area of 5,152sq.km which is 39% of total area of Kilimanjaro region making it the largest district in the region. Topographically, the area is divided into three main zones namely; Upland plateau zone which lies between an attitudes of 1100-2462m above sea level, Middle Plateau zone which lies between 900-1100m above sea level and the lowlands zone which rises from 500-900m above the sea level (URT 2007).

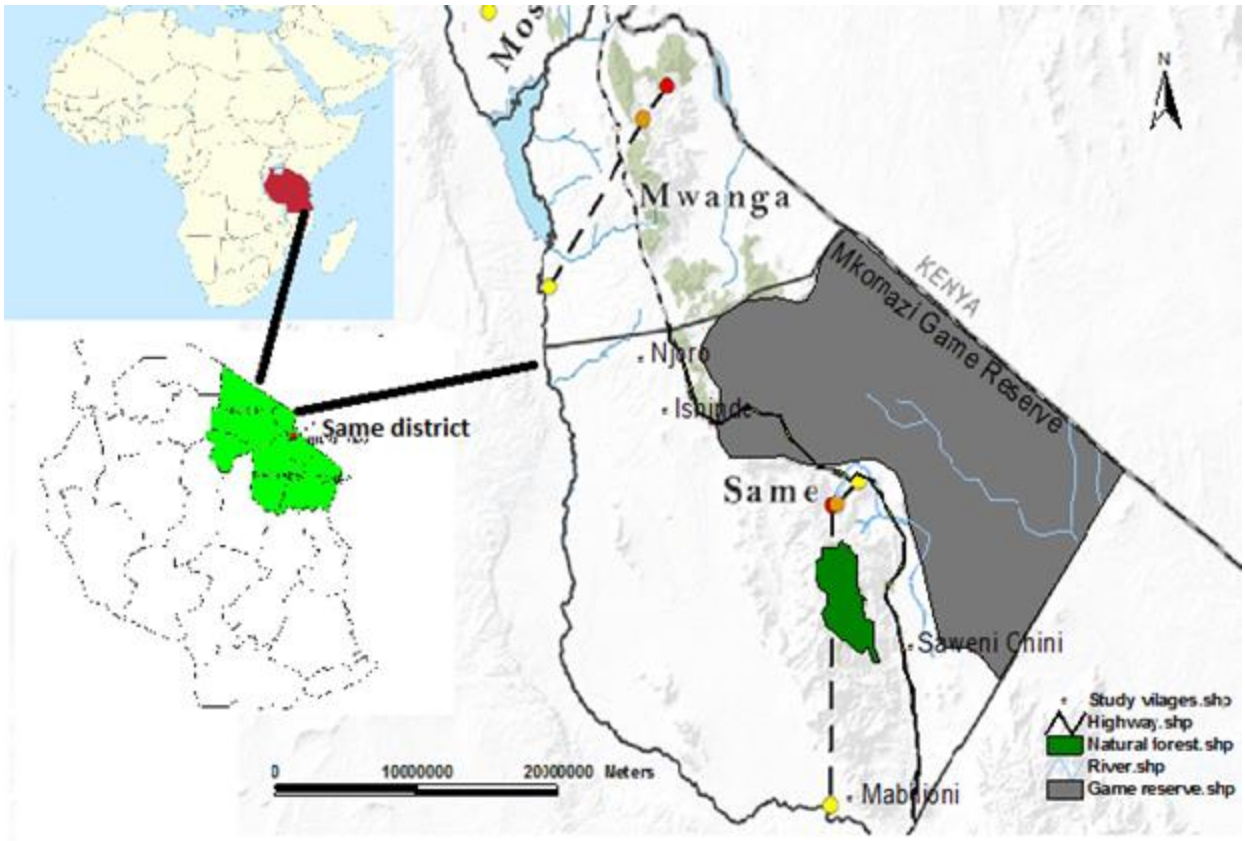


Fig 1: A map of Same District.

The temperature of the lowland semi-arid zone varies between $24^0$C to $34^0$C. The rains are bimodal. The average rainfall ranges between 500mm to 800mm. with scarcity of pasture in (between July and November) as compared to wet seasons (December and May). The South Pare Mountains are the source of all rivers and water streams which feeds the lowlands. Four important rivers include Hingili, Yongoma, Saseni and Nkombo. This makes proper management and conservation of the Chome forest reserve and traditional forest in the mountains critical for regulating water flow down streams to farming (irrigation) and agro-pastoralist communities.

**Economic activities:** Crop production is described as the main economic activity and source of livelihood in the study area regardless of semiarid nature of climate. Traditional staple food grown includes maize, beans, pigeon peas, and millet, while *Lablab purpureus* "lablab bean" and groundnuts are cash crops. Livestock keeping is combined with crop production where by animals are usually brought into the farm after crops are harvested. Manure from animals is collected and used in the field to increase fertility.

Pastoralists in this case Maasai initially occupied the lowland flood plains where they found pastures for their livestock. However, as population in the highlands increased, these lowlands areas became expansion zones for crop cultivation (IUCN, 2003). In general, both crop cultivation and pastoralism are constrained by the growing shortage of water. This has been a source of resource use conflicts in the area. This study was done in the resource-poor semi-arid lowlands of Same District.

## METHODS

**Data collection:** A combination of methods was used in the collection of both quantitative and qualitative data. The results from each of the research methods were integrated in the overall results. Qualitative methods provided an insight into reasons for some issues arising from the quantitative methods. They particularly, answered the questions of why and how.

**Sampling design and sample size:** A purposive sampling procedure was employed in selecting division and wards for the reason of accessibility and characterization of the research objectives. Two divisions of Same and Chome representing resource poor semiarid lowland were selected. Njoro and Hedaru wards were selected purposively as they have been receiving food aid frequently. Then four villages were selected using simple random sampling two from each ward. The first two villages from Njoro ward namely Njoro and Ishinde and the other two villages were from Hedaru ward namely Saweni and Mabilioni. A sampling frame for this study was the names of all households obtained in the village register book. For villages with no register books, the names of people were recorded with the assistance of village leaders from each hamlet and random selection using random numbers to avoid/reduce bias was done.

A sample size of 30 households was randomly selected for detailed study irrespective of the population size (Mbeyale, 2009).

The households interviewed were picked randomly. A total of 120 respondents from 4 villages were interviewed in this study (Table 1).

Table 1.Distribution of respondents in the study villages, Same District.

| Village name | Number of households | No. of sampled households |
|---|---|---|
| Njoro | 472 | 30 |
| Ishinde | 283 | 30 |
| Mabilioni | 609 | 30 |
| Saweni | 600 | 30 |
| Total | 2094 | 120 |

Source: Own field survey data 2010 and Population census 2002 (URT, 2003).

**Primary data collection:** Both qualitative and quantitative data were collected using a combination of methods based on the study objectives; Participatory Rural Appraisal (PRA), structured questionnaire, discussion with key informants, Household Food Insecurity Access Scale (HFIAS), market surveys and participant observation was used for primary data collection. Moreover, the existing publications, reports and other official documents relating to the subject were used as secondary data.

**Secondary data:**The researcher spent some time searching relevant information in libraries such as Sokoine University of Agriculture (SNAL), Dar es Salaam University, projects, government offices and internet. Other government offices visited include Same District Land office, Same District Livestock office, and Same District Agriculture–irrigation office. Issues and data of interest that were collected related to food availability and access, livestock ownership, coping strategies and utilization and management of natural resources.

Data analysis

**Qualitative data analysis:** With the help of group discussions with local people to analyze the information produced during PRA exercises, immediate feedback was produced. Other data generated through participant observation and semi structured and unstructured interviews were subjected to content analysis. Content analysis helped to reduce the volume of recorded information or communication to a set of categories that represent some characteristics of the research. Thus information collected through verbal discussions with the key informants and from PRA groups was broken down into smallest meaningful units of information (Kajembe, 1994).

**Quantitative data analysis:** Data collected through structured household questionnaires were summarized and coded. Statistical Package for Social Sciences (SPSS) computer programme was used for data analysis. Descriptive statistical analysis was used in exploring the data for distribution of responses, central tendencies and dispersion. To assess socio-economic factors influencing perceived effectiveness of coping strategy against food insecurity by households in the study area, a logistic regression model was used. Perceived effectiveness of household's coping strategy against food insecurity being the binary dependent variable ($Y_i$)

whereby, for the case of dependent variable ($Y_i$) respondents who accept coping strategy in use is helpful to reduce food insecurity it is considered effective coping strategy ($Y_i = 1$) while, if respondent reject coping strategy being helpful considered not-effective coping strategy ($Y_i = 0$). The independent variables were socio-economic factors (Age of the respondent, sex of the respondent, family size of the respondent, residence duration of the respondent, number of livestock owned, education level of the respondent, size of the irrigation farm land owned).

**Logistic model:** The logistic model predicts the likelihood of occurrence of the event (Menard, 1995), which is predicted by odds (Y = 1).

This was given by equation:

dd Y = P(Y = 1)/(1 - P(Y = 1 )……(2)

The logit (Y) was given by the natural log of Odds; that is

$$\underline{\ln p(Y_i = 1)} = \log \text{Odds} = \text{logit}(Y)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(3)$$
$$1 - p\,(Y_i = 1)$$

Where:

$Y_i$ = $i^{th}$observed value of perceived effectiveness of coping strategy.

The logistic regression model II specification was in a form:

$$\underline{\text{Ln } p(Y_i = 1)} = \beta o + \Sigma\, \beta_1 X_1 + \ldots\ldots + \Sigma\, \beta_k X_k \ldots\ldots\ldots\ldots\ldots\ldots(4)$$
$$1 - p\,(Y_i = 1)$$

Where;

$Y_i$ = dependent variable, perceived effectiveness of coping strategy

$X_i$-$X_k$ = explanatory variables

$\Sigma_0$ = constant term of the model without the independent variables.

$\Sigma_1$ = independent variable coefficients.

**Independent variables:**$X_1$ =Age of household head (continuous); This refers to ages of the sample household heads in years. It was expected that older household heads are less active and hence rely less on commonly used coping strategies. In other ways, it was expected that young people are more likely to be diversifiers of coping strategies than the old ones who are expected to have better possession of resources accumulation. Thus, effectiveness of coping strategies is expected to decrease with age. The expected sign for Beta values was negative (-β).;$X_2$ = Sex of the household head (dummy) ;Sex was dummy representing Household Head (HH) sex. Men and women have different access to resources and opportunities (Ellis, 2000). It was assumed that female headed households (FEHHs) have less chance to participate in coping strategy activities since they invest much time in domestic roles such as child care not denying their active role in different coping strategy activities. Therefore, in this study, sex was expected to be negatively related to effectiveness of the food insecurity coping strategies by FEHHs. The expected sign for Beta values was negative (-β); $X_3$ = Family size (continuous), Family size refers to the number of household members. Large family size demands large amount of production to feed its members, i.e., as family size increases, the demand for food increases. This means the larger the family size the less the probability of high effectiveness of food insecurity coping strategy. Thus was assumed to have negative sign to regression value (-β).,$X_4$ = Residence duration (continuous).

Number of years that individual stayed in village. It was assumed that number of years that household head have stayed in the village to be considerably associated with effectiveness of food insecurity coping strategy. Those who recently moved into the villages were expected to face more challenges than those who have stayed longer. Those who have stayed longer were expected to be in better position as they are well aware of their environment and have established good social network to obtain social and economic support. The expected sign for Beta values was positive (+β); $X_5$ = Herd size (continuous), Livestock holding was the number of livestock owned by HHs. Livestock benefit much and perceived as the accumulation of wealth, use for draft power, manure, income from sale of milk, butter and sale of live in times of risk to buy necessities. The household having larger size of livestock can have better chance to have better income and food security. The more livestock owned by the household will be the less possibility of the households choice to participate in less effective coping strategy activities. The expected sign for Beta values was positive (+β). $X_6$ = Education level (continuous) , Education level of the household was recorded with respect to number of years that a respondent spent in schooling. Increase in education was assumed to reduce strategies utilized by the households because people tend to be more financially secured when educated, instead of relying on coping strategies. The expected sign of the regression coefficient of educational level was negative (-β), $X_7$ = Size of irrigation farmland owned (continuous),

Irrigation farmland referred to the size of land owned by household under irrigation system in hectare. The household practicing dry season irrigation farming has positive impact on likelihood of more cultivation and more possibility of production which in turn increases farm income and improves food security. Therefore, having more irrigation faming land size was expected to reduce farmers' dependency on off-farm activities such as casual labour in order to be food secure. The expected sign for Beta values was negative (-β).

**RESULTS AND DISCUSSION**

The results includes types of food insecurity in the study area; the most common type of food insecurity in the study area; levels of the most common type of food insecurity; coping strategies developed by households against most common type of food insecurity and socio-economic factors underlying effectiveness of rural household key copping strategy.

**Types of food insecurity based on wealth ranking in the study area:** Table 2 shows relative wealth ranking for the study villages. Results indicate the existence of two types of food insecurity based on the wealth ranking. Poor income group households were found to face chronic food insecurity as a result of lack of resources to produce or acquire food. These results concur with those of World Bank (2001) which argued that chronic food insecurity at the household level is mainly a problem facing poor households in most parts of the world. On the other hand middle income households were found to face seasonal food insecurity due to decline in households access to needed food, resulting from instability in production.

The results reveal that 73.3%, 63.3%, 64.7% and 75.6% of the households in Njoro, Mabilioni, Saweni and Ishinde respectively are grouped as poor. They are chronic food insecure for more than 4 months, since they can only produce less than 30% of normal crop production, have income of less than TZS 50,000 per month, have farm size of less than 1 ha, have less than two meals per day, owning less number of livestock (2-10 chickens and less than 3 goats) and lack sufficient alternative sources of income. In most cases, these households are excluded in most interventions.

On the other hand 23.3%, 33.0%, 30.7% and 21.1% of the households in Njoro, Mabilioni, Saweni and Ishinde respectively belong to middle income group. They have average crop production which sustains 8-9 months.

They seasonal food insecure for 3 to 4 months, due to instability in food production as they can produce 31% to 60% of normal crop production, have income of TZS 50,000 to TZS 100,000 per month, have farm size of 1 to 2 ha, have two to three meals per day, livestock owned; 5 to 10 cattle, 10 to 30 goats, 10 to 20 chickens and own assets including; cellular phone, bicycle, radio. Few of the households 3.3%, 3.7%, 4.6% and 3.3% from Njoro, Mabilioni, Saweni and Ishinde respectively belong to rich income group. These have good crop production which sustaining throughout the year. Therefore, the results reveal that, chronic food insecurity is the most common type of food insecurity in the study area because majority (above 60%) of the households are being affected with it.

The study found household heads that belong to the relatively rich income groups mobilized their resources and invested in dry season vegetable production through irrigation. In such investment they employ poor to perform all farm operations. They also bought water pipes, sprinklers, farm inputs such as inorganic fertilizer, and pesticides and quality seeds. As a result they had physical and economic access to sufficient food throughout the year. While household heads that belong to poor income group depend much on maize, beans and lablab bean production during rainy season, the rest of the time; they are engaged in casual labour or illegal activities such as pit sawing. The minority of poor who are engaging in dry season vegetable production own small plots and produce less because they lack enough water, and are not connected to irrigation facilities. Therefore they had neither physical nor economic access to sufficient food throughout the year.

**Most common type of food insecurity in the study area:** Chronic food insecurity is the most common type of food insecurity in the study area because more than 80% of the estimated total population in Njoro, Mabilioni, Saweni and Ishinde experienced food insecurity for more 3 months. Households with food shortage for 1-3 months were referred to as seasonal food insecure, while those with food shortage for more than 3 months were referred to as chronic food insecure. Table 3 shows food insecurity months perceived by households in the study area. The result shows that only 0.8% of households did not have sufficient food from January to December, 33.3% did not have food to cover the period of January to June, while 16.7% did not have sufficient food from February to July, 37.5% did not have food to cover from November to July and 11.7% had no sufficient food from April to June.

Table 2.Relative wealth ranking in the study area

| Income group | Wealth Criteria | Value in percentages | | | |
|---|---|---|---|---|---|
| | | Villages | | | |
| | | Njoro N=30 | Mabilioni N=30 | Saweni N=30 | Ishinde N=30 |
| Rich | Have sufficient food to meet household need because production is more than 61% of normal production, Have land more than 2 ha; Have high income of more than TZS 100,000 shillings per month; Have a good houses made by bricks/blocks and iron sheet; Livestock: more than 30 cattle, more than 40 goats and more than 30 chickens; Have kiosk/shop as other source of income; Have a car and/motor cycle and Own irrigation plot within or outside the village. | 3.3 | 3.7 | 4.6 | 3.3 |
| Middle | They produce between 31% and 60% of normal crop production but are food insecure for 1-3 months, Have houses made by burnt bricks and iron sheets, Have income between TZ 50,000 and TZS 100,000/= per month; Have farm sizes of 1ha to 2ha; Livestock: 5-10 cattle,10-30 goats and 10-20 chickens; Two to three meals per day and Assets owns include cellular phone, bicycle and radio. | 23.3 | 33.0 | 30.7 | 21.1 |
| Poor | They produce less than 30% of normal production hence are food insecure for more than 3 months; Houses made by muddy walls and roofed with grasses; Have income between TZS 20,000 and TZS 50,000/=per month, Have farm sizes of less than 1 ha, less than two meals per day; Have no means of transport; Have 2-10 chickens and Have less than 3 goats. | 73.3 | 63.3 | 64.7 | 75.6 |
| Total | | 100.0 | 100.0 | 100.0 | 100.0 |

Source: Own survey data 2010.

Table 3: Food insecurity months in the study area

| Months | Values in percentages | | | | Total N=120 |
|---|---|---|---|---|---|
| | Name of villages | | | | |
| | Njoro N=30 | Mabilioni N=30 | Saweni N=30 | Ishinde N=30 | |
| January – June | 5.0 | 9.2 | 6.7 | 12.5 | 33.3 |
| February – July | 4.2 | 5.8 | 3.3 | 3.3 | 16.7 |
| November – July | 11.7 | 3.3 | 15.0 | 7.5 | 37.5 |
| April – June | 3.3 | 6.7 | 0.0 | 1.7 | 11.7 |
| January – December | 0.8 | 0.0 | 0.0 | 0.0 | 0.8 |

Source: Own survey data 2010

Furthermore, the study revealed that, since more than 60% of the households in the study area were poor income group facing chronic food insecurity while less than 30% of the households in the study area were middle income group facing seasonal food insecurity therefore, chronic food insecurity found to be the most common type of food insecurity in the study area (table 3). The findings concurred with the report of FSN (2010) which established that 23,301 people or (9%) of 254,600 estimated total population of Same District

experiencing seasonal food shortage while 44,609 people or (18%) experienced acute food shortage.

The period of food shortage found to vary with food stocks available in the households; however, it ranges between 3 to 8 months. Assessment on food stocks revealed variations among households. Rich households reported to have more than 10 bags of maize and 8 bags of beans while those with middle income reported to have 2-9 bags of maize and 5 bags of beans and less than 1 bag of maize and beans for those poor income group. It was revealed from the study villages that household to be food secure should have more than 10 bags of maize and 8 bags of beans. This implies that, household with less than 10 bags of maize and 8 bags of beans were food insecure.

**Levels of the most common food insecurity:** Table 4 shows categories of food insecurity among households in the study area. The results reveal that, 6.3%, 53.8% and 6.6%, 56.1% of the households in Mabilioni and Saweni respectively are grouped as severely food insecure and moderate food insecure. They are also chronic food insecure, poor, experiencing thrice or more than ten times in a month food insecurity (access) conditions including; eating a monotonous (little diversity) diet or undesirable foods, running out of food for a week or more in a month, cut back on quantity by reducing number of meals to two or less than two meals per day, going to bed hungry, or going a whole day and night without eating.

Table 4. Categories of food insecurity among households in the study area

| Level of food insecurity | Food insecurity criteria | Value in percentages | | | |
|---|---|---|---|---|---|
| | | Villages | | | |
| | | Njoro N=30 | Mabilioni N=30 | Saweni N=30 | Ishinde N=30 |
| Severely food insecure | Experiences more than ten times in a month food insecurity (access) conditions including; sacrifices quality more frequently by eating a monotonous (little diversity) diet or undesirable foods, cutting back number of meals to less than two meals per day, running out of food for more than a week, going to bed hungry, or going a whole day and night without eating. | 13.1 | 6.3 | 6.6 | 12.7 |
| Moderate food insecure | Experiences thrice to ten times in a month food insecurity (access) conditions including; sacrifices quality more frequently by eating a monotonous (little diversity) diet or undesirable foods, cut back on quantity by reducing the number of meals to two meals per day, running out of food for a week, going to bed hungry, or going a whole day and night without eating.. | 60.3 | 53.8 | 56.1 | 62.4 |
| Mild food insecure | Experiences once or twice in a month food insecurity (access) conditions including worries about not having enough food, inability to eat preferred foods, eats a more monotonous (little diversity) diet than desired, cut back number of meals between two to three meals a day, running out of food for less than a week. | 23.3 | 36.3 | 30.6 | 21.6 |
| Food secure | Experiences none of the food insecurity (access) conditions, or just experiences worry. | 3.3 | 3.6 | 6.7 | 3.3 |
| Total | | 100 | 100 | 100 | 100 |

Source: Own Survey data 2010

On the other hand the results reveals that, 13.1%, 60.3% and 12.7%, 62.4% of the households in Njoro and Ishinde respectively are grouped between severely food insecure and moderate food insecure they also chronic food insecure, poor, they experience thrice or more than ten times in a month food insecurity (access) conditions including; eating a monotonous (limited diversity) diet or undesirable foods, running out of food for a week or more in a month, cut back on quantity by reducing number of meals to two or less than two meals per day, going to bed hungry, or going a whole day and night without eating.

The difference can be attributed to the fact that production of maize and vegetables such as onions, tomatoes and cabbages in Mabilioni and Saweni villages makes them better off because they have rain-fed agriculture and irrigation of which those who have land to irrigate can still produce some food as compared to Njoro and Ishinde villages who mainly depends on rain-fed agriculture alone.

Furthermore, the results reveal that, 23.3%, 36.3%, 30.6% and 21.6% of the households from Njoro, Mabilioni, Saweni and Ishinde respectively were grouped as mild food insecure. These are the middle income group based on the wealth ranking experiencing once or twice in a month food insecurity (access) conditions including worries about not having enough food, inability to eat preferred foods, eats a more monotonous (limited diversity) diet than desired, cut back number of meals between two to three meals a day, running out of food for less than a week. On the other hand, 3.3%, 3.6%, 6.7% and 3.3% of the households from Njoro, Mabilioni, Saweni and Ishinde respectively were grouped as food secure. These were rich income group experienced none of the food insecurity condition.

**Coping strategies against the most common food insecurity:** Table 5 shows households coping strategies against food insecurity in the study area. The results reveal that, 87.2% of the respondents opted casual labour within or outside the villages as the most frequently used coping strategy against food shortage, followed by 70.8% who opted for petty business, 48.3% depends on remittances from relatives outside the village, 15.8% depends on temporary migration, and 5.0% opted fishing. In order of importance coping strategies can be presented as: casual labour, petty business, remittances, temporary migration and fishing.

Table 5. Copping strategies against food insecurity in the study area

| Coping strategies | Values in percentage | | | | Total | Rank |
|---|---|---|---|---|---|---|
| | Name of village | | | | | |
| | Njoro | Mabilioni | Saweni | Ishinde | | |
| Casual labour | 20.7 | 22.7 | 22.3 | 21.5 | 87.2 | 1 |
| Petty business | 19.6 | 17.5 | 16.3 | 17.4 | 70.8 | 2 |
| Remittances | 15.0 | 7.5 | 12.5 | 13.3 | 48.3 | 3 |
| Temporary migration | 7.5 | 0.8 | 0.8 | 6.7 | 15.8 | 4 |
| Fishing | 0.0 | 5.0 | 0.0 | 0.0 | 5.0 | 5 |

Source: Own survey data 2010.

Casual labouris the commonly used coping strategies for most households because it does not require specialized skills and easy to get. Common type of casual labour were farm-based including weeding, plowing land, grazing livestock, planting and harvesting crops such as lablab bean an onions. Average wage for weeding 0.5 ha is TZS 20,000/= (Us $12.2) while planting is TZS 20,000/= (Us $ 12.2) plowing land is TZS 30,000/= (Us $ 18.3) and TZS 40,000/= (Us $ 24.4) for grazing livestock per month. Availability of casual labour is seasonal. Planting, weeding and harvesting are available during rainy seasons while plowing land and grazing livestock are carried during dry seasons. Petty business was found to be another food insecurity coping strategy performed by more than 70% of the households (Table 5). The most common business observed include food vendoring, selling vegetables, bites, fruits and local brews. About 17% exploit forest resources for earning cash to buy food. Forest products exploited include firewood, charcoal, weaving materials, lianas for making fishing gears (fish traps), poles and withies. Firewood is exploited from regenerating forests that had previously been cleared and then left to fallow. Firewood is sold within the villages and some sold in nearby urban centers such as Hederu for Mabilioni and Saweni villages and Same for Njoro and Ishinde villages. The price for a

bundle of firewood ranges between TZS 500/= (Us $ 0.3) to TZS 1000/= (Us $.0.6) Charcoal making is mainly done in Njoro village, in a Njoro village forest found between the village and urban centre of Same. The price of charcoal is TZS 6000/= (Us $ 3.7) for the sack of 28Kg.

Weaving involved making of baskets and mats as main source of cash income for more than 75% of women in Mabilioni village. A woman who makes baskets, on average earns TZS 2000-TZS (Us $ 1.2) to 3000 (Us $ 1.8)/basket. In most cases baskets and mats are exchanged for food. In the exchange process 5 baskets or 3 mats are normally exchanged with a 20 liter bucket of maize. Basket making was found to contribute to food security for more than 80% of the households during acute food shortages. Remittances are cash assistance from relatives outside the village. The results indicate that remittance is most commonly used by households headed by elderly people who have relatives living in urban areas. These families found to receive between TZS 20,000 (Us $ 12.2) and TZS 60,000 (Us $ 36.6) twice in a year. Another strategy is temporary migration. Temporary migration involved seasonal movement of the household head to other villages for 2-3 months searching wage labour during food shortages, and then comes back when the period is over. It was taken as an extreme response to livelihood failure. In this men moves out of their villages leaving women taking charge of family matters. Temporary migration was seen as being crucial in years when food availability is significantly below usual levels and minor in a year in which there was an unexceptional level of food availability. Existence of irrigation and rain-fed agriculture in Mabilioni and Saweni villages reduced the importance of this coping strategy than in Njoro and Ishinde villages where this coping strategy was commonly used. The results concur with Swift (1989) found that, seasonal migration to be the last resort in a sequence of strategies designed to absorb the impact of the shock. Subsistence fishing is done by few people in Mabilioni, along Pangani River using traditional fishing gears such as hooks, fish nets and fish traps. According to the respondents, there is demand for fish at local and in nearby towns within the district. Other factors which favor fishing include knowledge on fishing and making fishing gears amongst some of the village members. The use of illegal fishing gear was reported, where by mosquito nets was commonly used. Furthermore, fishing has the potential to improve nutrition and income to the households. Already there are well established fish centers in Hedaru and Same Township where fish are sold. The average price in the village is roughly TZS 2500/= (Us $ 1.5) per 1Kg, but if transported to neighboring town may fetch up to TZS 4000/= (Us $ 2.4)per 1Kg, therefore increase profits.

From District socio-economic profile (2008) other coping strategies were given include: eating less preferred food such as wild amaranths, drying and storage big portions of meat for future use, skipping some meals mainly lunch, grinding whole maize grains without removing the bran to produce maize flour and foods, like bananas, cassava are peeled, dried and stored for use during acute shortages.

**Socio-economic factors underlying effectiveness of the key household coping strategy against the most common type of food insecurity:** A logistic regression model was used to determine socio-economic factors influencing effectiveness of casual labour as a main coping strategy against food insecurity used by households. Table 6 shows socio-economic factors enabling and constraining effectiveness of casual labour as the key household coping strategy against food insecurity. The model has predicted correctly the cases at 88.5% and statistically significant at $p<0.05$ with Chi-square value of 120. The high -2 Log Likelihood (96.87) indicates a fit between the model and the data. The Negelkerke R squared = 0.678 implying that 67.8% of observed variation in the effectiveness of coping strategies against food insecurity is explained by independent variables in the model.

From the study model, out of seven factors three had positive effects (enhancing), while other four factors had negative influence (constraining) the likelihood on effectiveness of the casual labour as food insecurity coping strategy by the study population. Socio-economic factors enabling effectiveness of casual labour as a key coping strategy against food insecurity include; age, family size and residence duration while socio-economic factors constraining effectiveness of casual labour as a key coping strategy against food insecurity include; sex, heard size, education level and size of irrigation farmland.

**Socio-economic factors enabling effectiveness of casual labour as the key household coping strategy against food insecurity**

**Age of the household head:**Increase in age of the household heads significantly (P< 0.05) enhanced the effectiveness of casual labour as the key household coping strategy against food insecurity by a factor of 1.482 (Table 7). The positive relationship between age of the household head and effectiveness of casual labour as the key coping strategy used has mainly emanated from the fact that older men usually have larger number of children under the study context. This increases the odds of the household to participate in casual labour in order to meet food needs. The results reveal that, 53.6% of household heads their age fall between 18-40 years old while, 35.5% were between 41-60 years old and 10.9% were above 60 years old (Table 7).

Table 6. Socio-economic factors enabling and constraining effectiveness of casual labour as household food insecurity coping strategy

| Factor $X_i$ | β | S.E. | Wald | df | Sig. | Exp(B) Odd ratio |
|---|---|---|---|---|---|---|
| Age | 1.39 | 0.195 | 4.058 | 1 | 0.044* | 1.482 |
| Sex | -4.85 | 1.396 | 12.08 | 1 | 0.001* | 10.813 |
| Family size | 2.61 | 0.263 | 5.412 | 1 | 0.020* | 3.844 |
| Residence duration | 0.58 | 0.529 | 1.204 | 1 | 0.272Sns | 1.786 |
| Herd size | -0.40 | 1.271 | 0.025 | 1 | 0.875Sns | 4.222 |
| Education level | -0.27 | 0.367 | 8.163 | 1 | 0.999Sns | 4.324 |
| Size of irrigation land | -0.64 | 4.08 | 3.599 | 1 | 0.480Sns | 0.413 |
| Constant | -9.205 | 2.245 | 15.573 | 1 | 0.018 | 36.487 |

**Key:** The model has predicted correctly the cases at 88.5% and statistically significant at P<0.05. The Negelkerke R square is 0.678; indicating that about 67.8% of the observed variation in effectiveness of the casual labour as coping strategies is explained by the independent variables. The -2 Log likelihood (=96.87) indicates that there is fit between the model and the data. Model Chi-square 120, significant at 0.05 (df=8), -2 Log likelihood 55.87, Negelkerke R square 0.678, number of cases 120. Overall Percentage 93%, Note: * = statistically significant at 5 %( P<0.05) level of significance, Odds ratio = Probability of success/probability of failure, SE = Standard Error of the estimate, Sns = statistically not significant at 5% (P>0.05) level of significance.

**Age of the household head:** Increase in age of the household heads significantly (P< 0.05) enhanced the effectiveness of casual labour as the key household coping strategy against food insecurity by a factor of 1.482 (Table 7). The positive relationship between age of the household head and effectiveness of casual labour as the key coping strategy used has mainly emanated from the fact that older men usually have larger number of children under the study context. This increases the odds of the household to participate in casual labour in order to meet food needs. The results reveal that, 53.6% of household heads their age fall between 18-40 years old while, 35.5% were between 41-60 years old and 10.9% were above 60 years old (Table 7).

Table 7. Age composition in the study area

| Age groups of the Household head | Values in percentage | | | | |
|---|---|---|---|---|---|
| | Name of village | | | | |
| | Njoro N=30 | Mabilioni N=30 | Saweni N=30 | Ishinde N=30 | Total N=120 |
| 18-40 | 9.3 | 19.7 | 17.3 | 10.6 | 56.9 |
| 41-60 | 4.7 | 8.6 | 9.3 | 5.6 | 28.2 |
| >60 | 5.3 | 3.3 | 1.7 | 4.6 | 14.9 |

Source: Own Survey data 2010

Furthermore, the results reveal that older household heads could not get enough only from agriculture alone to be food secure therefore, they had to engage mainly on casual labour as their main source of cash to buy food. Therefore, following the series of shocks (i.e. weather) the limited productive resources, food stocks or other forms of liquid capital, belonging to older household head age groups, and their lack of specialized skills to undertake anything other than basic wage labour, leave them significantly exposed to food

insecurity.

**Family size:** The increase in the family size significantly ($p<0.05$) enhanced the effectiveness of casual labour as household coping strategy against food insecurity by a factor of 3.844 (Table 6). This implies that large household size has higher demand for food thus making them vulnerable to be food insecurity. The study finding reveals that 57% of the respondent had family size between 5 to 10 members, 40.4% of the respondents had family size less than 5 members while 2.1% of the respondent had family size of more than 10 members (Table 8).

Table 8.Family size in the study area.

| Family size | Values in percentage | | | | |
|---|---|---|---|---|---|
| | Name of village | | | | |
| | Njoro N=30 | Mabilioni N=30 | Saweni N=30 | Ishinde N=30 | Total N=120 |
| <5 | 9.6 | 14.2 | 10.8 | 5.8 | 40.4 |
| 5-10 | 20.2 | 10.8 | 8.2 | 18.3 | 57.5 |
| >10 | 1.3 | 0.0 | 0.0 | 0.8 | 2.1 |

Source: Own Survey data 2010

This increases the odds of the larger household size to participate in casual labour in order to meet food needs. Study findings revealed that households with larger family size were able to obtain different types of casual labour such as weeding, tilling, fetching water and house construction in order to obtain cash for purchasing food. These findings concur with that of FAO (1992) report that, in thirteen surveyed areas of Africa, Asia and Latin America food insecure households tends to be larger and have higher number of dependants and younger age composition. Furthermore, van Vuuren (2000) argued that, generally, the food insecure households are characterized by larger household size, more children and school-going children. Also Ashimogo (1995) found that families that ran short of maize before harvest were larger than those which were maize surplus in Sumbawanga Region. This indicates that larger family size are vulnerable to food insecurity than small sizes ones. Therefore, it was easy for households with large family size to perceive casual labour as effective means to cope against food insecurity.

**Residence duration:** The increase in the number of years of residence by the household was positively correlated to the effectiveness of casual labour as the key food insecurity coping strategy with regression coefficient $\beta = 0.58$ and wald ratio of 1.204 (Table 6). This suggests that increase in number of years of residence increase dependence on casual labour (on- and off-farm) to offset deficits in food production. It has been revealed from the study that people who been born in an area were trusted, could be borrowed food or money and repayment made latter by kind through offering casual labour. Furthermore, they were well informed of how, where and when to obtain different types of casual labour. But the increase of odds of effectiveness of casual labour as food insecurity coping strategy with years of residence was not statistically significant.

**Socio-economic factors constrain effectiveness of casual labour as the key household coping strategy against food insecurity**

**Sex of household head:** Table 6 shows that sex of the respondent was found to be negatively correlated to the effectiveness of casual labour as a key household's coping strategy against food insecurity with regression coefficient $\beta = -4.85$ and wald ratio 12.08. This implies that among the two sex one is denied an opportunity to effectively access casual labour as food insecurity coping strategy. The study found that female headed households have difficulty in casual labour participation as food insecurity coping strategy than their male counterpart. It was further revealed that cultural barriers which give priority males make it hard for women to have access to productive resources which invariably affects their food security status. The study found that male headed households significantly participated more in diverse casual labour activities such as brick making, house construction, farm and fetching water that bring in higher income while female headed households participates mostly in farm labour. This implies that women are marginalized to the access of casual labour for wage. These findings are agrees with Mbughuni (1993) who identified several key themes linking gender to household food security and coping

strategies reported that, households headed by women are subject to institutionalized gendered inequalities, and that they are exposed to far greater risk of poverty.

**Herd size owned by household:** Number of animal owned by a household is negatively correlated with effectiveness of casual labour as household coping strategy against food insecurity with regression coefficient β = -0.40 and wald ratio 0.025 (Table 6). This suggests that increase in number of livestock holding make household to realize high return and decide to rely less on casual labour. However, the decrease of odds of effectiveness of casual labour as household coping strategy against food insecurity with herd size was not statistically significant. The plausible explanation is that households in the study villages own small number of animals mostly chickens with low returns and used mainly for home use. The study further revealed that, stocks of money are substituted by livestock whereby live animals are being sold to have money to meet the basic household needs such as food, shelter and clothing. The main livestock kept by households in the study villages are local cows, dairy cows, local chicken, layers, ducts, goats, sheep, and pigs. Through selling livestock, average household fetch TZS 199,240/= per year. The prices of livestock are relative higher in village markets whereby cattle sold for TZS 400,000/=, goat TZS 70,000/= and chicken TZS 8,000/=.

It was noted that, selling chicken was one of the main livelihood strategy to the poor households in spite of massive killings by serious diseases such as Newcastle Disease *"kideri"*, typhoid disease, wild-animals such as wild cat, foxes and fowls and shortage of feeds for animals making this business at risk. These findings are in line with SUA (2006) which revealed that, health related livestock problems are one of the most important single factors limiting the productivity of livestock and is one most important factor afflicting heavy stock losses in sporadic and epidemic proportion. Therefore participation in livestock keeping makes these households more food secures than depending much on casual labour.

**Educational level:** Table 6 show that number of years spent in school was negatively correlated with the effectiveness of casual labour as a key household's coping strategy against food insecurity with regression coefficient β = -0.27 and wald ratio of 8.163. This implies that probability of dependency on casual labour as effective means to cope against food insecurity decrease with increase in the education level of the household. The plausible explanation might be due to the fact that increase in education tends to enable households to identify existing opportunities by establishing small business such as food vendors, tailoring, kiosk, selling sand and gravels, business middle men and transporting crops and livestock. Table 9 shows education level by village of the respondent.

Table 9.Education level in the study area.

| Level of education | Values in percentage | | | | |
|---|---|---|---|---|---|
| | Name of village | | | | |
| | Njoro N=30 | Mabilioni N=30 | Saweni N=30 | Ishinde N=30 | Total N=120 |
| Primary education | 21.6 | 19.3 | 20.3 | 20.7 | 81.9 |
| Secondary education | 0.0 | 3.3 | 2.1 | 0.0 | 5.4 |
| Tertiary education | 0 | 0.8 | 0.8 | 0 | 1.6 |
| No formal education | 2.7 | 4.3 | 3.3 | 0.8 | 11.1 |

Source: Own Survey data 2010

The results reveal that majority of household heads (81.9%) had primary education, 5.4% had secondary education, 1.6% had tertiary education and 11.1% had no formal education. Education level is slightly higher in Mabilioni and Saweni villages both with 0.8% of household heads respectively had tertiary education while in Njoro and Ishinde villages no household head had tertiary education. The difference is perhaps due to limited livelihood opportunities for educated person to stay at village. Household with no formal education were also found to be chronic food insecure. This implies that, probability of the farmer to depend less on casual labour and still be food secure increases with acquisition of formal education.

**Size of irrigation farm land:** The increase in size of irrigation farmland of the household was negatively correlated to the effectiveness of casual labour as a key coping strategy food insecurity with regression value of

β = -0.64 and wald ratio of 3.599 (Table 6). This means that the probability of dependency on casual labour as effective means to cope against food insecurity decreases with increase in land size under irrigation. The plausible explanation is that households with irrigation land tends to allocate most of their time and energy in their own farm throughout the year and become food secure while those with no irrigation farm land offer labour for wages in order to be food secure. The results reveal that, few farmers in Mabilioni village owning land close to Pangani River work in their own farm throughout the year growing vegetables. Likewise in Saweni village, it was found that households with plots at Sawni-*juu* were able to cultivate maize and beans during rainy season and vegetables during dry season. These were found to be food secure without depending on casual labour. The increase of odds of effectiveness of casual labour as coping strategy against food insecurity with irrigation farmland size was not statistically significant. The implication is that few households had irrigation farmland; therefore most people still depended on casual labour to cope against food insecurity.

**CONCLUSION**

The study identified that households in the study area are facing two types of food insecurity. The majority more than 65% were poor income group households facing chronic food insecurity while the others were middle income households based on the wealth ranking are facing seasonal food insecurity. The study found household heads that belong to the rich income groups mobilized their resources and invested in dry season vegetable production. While household heads that belong to poor income group depend more on casual labour.

The study revealed that three levels of household chronic food insecurity exist in the study area namely severe food insecurity, moderate food insecurity and mild food insecurity. These were chronic food insecure, poor, experiencing food insecurity (access) conditions including; eating a monotonous (little diversity) diet or undesirable foods, running out of food in a month, cut back on quantity by reducing number of meals per day,

going to bed hungry, or going a whole day and night without eating. Also chronically food insecure households were found to have low education level, have large family size, most elders, have low income, own small number of animals and have no access to irrigation land.

The study showed that households in the study area employ a range of coping strategies during chronic food insecurity. Some of the commonly mentioned strategies in order of importance were: casual labour, petty business, remittances, temporary migration and fishing. Casual labour was mainly farm based including weeding, plowing land, grazing livestock, planting and harvesting crops while petty business involved food vendoring, local brewing, selling of bites, vegetables, fruits, forest products such as firewood, charcoal and weaving materials. Also petty business was found to be conducted in barter trade where baskets and mats were exchanged with food. The coping strategies of resource users such as charcoal making, weaving and fishing was observed to be a short term solution to immediate household level problems, but poses long term problems of degradation of resource base.

The study revealed that casual labour was a key coping strategy against food insecurity in the study area. This was because it does not require specialized skills and easy to get. Socio-economic factors that significantly enabled effectiveness of casual labour as a key coping strategy against food insecurity included; age of the household head and family size. On the other hand socio-economic factor that significantly constrained effectiveness of casual labour as a key coping strategy against food insecurity was sex of the household head. In general it was concluded that access to quality education, irrigation farms and ownership of livestock could help households in the study area to reduce high dependence on casual labour alone to cope against food insecurity.

**RECOMMENDATIONS**

These include irrigation, education on good storage of harvested food, supply of short maturing seeds, sensitization on the use of drought resistant crops such as millet and increase relief food. Supply of short maturing maize seeds was given high priority by households. Educating farmers on planting drought resistant crops such as millet and sorghum were given second priority while improving irrigation

infrastructures ranked third, sensitization farmers on good storage of harvested food ranked fourth and last are provision of safety nets.

Policy-makers should also reflect on the most suitable

ways of supporting diversity of livelihood opportunities. This needs rapid development of non-agriculture sector in coordination with agriculture sector. Only with more appropriate policies that recognize the importance of diversity will be possible for more people to make positive exits from food security risk through diversity of livelihood opportunities. This can be achieved by establishing credit scheme targeting rural poor households to start off farm income generating activities. These should be well administered to avoid credit misuse. There is also a need to ensure that concerns of the specific groups in the society such as female, elderly people and the disabled to be reflected in public policies and this will be at the core of successful food security policies by bring these groups into the very center of policy making processes.

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