COMPARATIVE STUDY OF LIVELIHOOD STRATEGIES AND FOOD SECURITY OF RECENT MIGRANTS AND NON MIGRANTS IN KILOMBERO VALLEY

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ABSTRACT

This study compared the livelihood strategies of two communities in Kilombero Valley, following the coming of agro-pastoralists with large herds of cattle. These are the indigenous peasants and the migrant agro-pastoralists. The study used cross sectional design employing both random and purposive sampling to obtain the respondents. The study used Dietary Diversity Score and anthropometric assessments of the under-five children. Results show that the proportion of households with DDS below the median of 6 scores in a scale of 12 is 74%. The peasants had mean DDS of 5.2 which is lower than 6.8 of agro-pastoralists. The wasting rate among peasant children is 6.06% which is much higher than 5.3% of Morogoro Region. The agro-pastoral children have higher stunting rate of 51% but similar rates of wasting and underweight with the Morogoro Region and National averages. However the anthropometric assessment of this study showed that the peasant children are nutritionally better compared with the agro-pastoral children. Livelihood assets like natural resources, education of household spouses, tradition and culture of the people have shown to be among significant factors affecting food and nutrition security. It is therefore recommended that some detrimental cultures be abolished as they impede efforts to achieve the desired livelihood outcomes. Diversification of income sources other than selling food crops or agricultural labour is an important strategy to increase people's resilience to shocks and to protect them against the current fragility. Various organisations operating in the valley should establish programs to turn around the attitudes of people towards good feeding habits like diversifying diets and paying attention to the special requirements of vulnerable members of the household like children and lactating or pregnant mothers. To achieve this, emphasis on female education should be an indispensable element of future development programs in the valley.

DECLARATION

I, WILSON JONAS NYANGILE, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work, done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution

_____   _____

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DEDICATION

This work is devoted to my whole family: My wife Jojina and children Roy, Luvende, Daudi and the new born Sapanga whose consent and tireless prayers filled me with strength, and courage to continue with studies. The grief they have suffered during the two years of my absence at home must have been too great for them to endure. God bless you all

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LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA   Analysis of Variance

DDS   Dietary Diversity Score

FAO   Food and Agriculture Organisation

FEWS   Famine Early Warning System

GIEWS   Global Information Early Warning System

HAZ   Height-for-Age Z-score

HWZ   Height-for-Weight Z-score

MARD   Master of Arts in Rural Development

MDG   Millennium Development Goals

MUAC   Mid Upper Arm Circumference

NBS   National Bureau of Statistics

NSGRP   National Strategy for Growth and Reduction of Poverty

SAM   Severe Acute Malnutrition

SD   Standard Deviation

TDHS   Tanzania Demographic and Health Survey

UNDP   United Nations Development Programme

URT   United Republic of Tanzania

USAID   United States Agency for International Development

VAM   Vulnerability Analysis and Mapping

VEO   Village Executive Officer

WAZ   Weight-for-Age Z-score

WDC   Ward Development Committee

WEO   Ward Executive Officer

WHO   World Health Organisation

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Loss of grazing lands due to environmental degradation and high grazing intensities in the main pastoral areas of Tanzania have led to massive migration of livestock and pastoral communities like the Maasai, Barbaig and Sukuma ethnic groups. For the last three decades there has been a steady movement of livestock from the north and northwest regions of the country towards the south. The main destination areas include Morogoro, Coast, Mbeya, Lindi and Rukwa Regions (Mpiri, 1995). This has brought different ethnic and livelihood groups into the same ecological ranges, with increased potential for environmental degradation and resource-use conflicts. In some areas the immigrant and indigenous ethnic groups, who are peasants, have forged complementary co-existence, like in Kilombero valley and Usangu plains (Luwanda, 2008; Kajembe *et al*., 2003). In other areas, this has caused conflicts and even violent clashes and loss of lives upon natural resources scramble. Examples of such clashes have occurred in Ruvu Basin and in Kilosa District, Morogoro Region (Ndagala, 1998; Msuya, 2009), and the recent Ikwiriri conflicts in Coast Region.

Kilombero valley is the largest host of the Sukuma agro-pastoralists pushed from the now conserved Usangu plains in Mbeya and other region in the country (Kato, 2007). According to Lee (1966), migratory behaviour of pastoral and agro-pastoral communities can be explained by the Push-Pull model of the theory of migration. In his model, Lee analysed the relationship between areas of origin and destination in migration. Push factors occur in the places of origin which include increased population density, shortage of pasture, expansion of agriculture, lack of water and food, pestilence, scarcity of arable

land and conflicts. These may cause pastoral and agro-pastoral people to flee. In the other hand, the pull factors occur in the places of destination, in which availability of water and arable land, low population density and high agricultural productivity attract in-migration. Therefore apart from herding, the immigrants are in search of other livelihood activities like agriculture and small and medium enterprises (Chamwali, 2000). Migrants who come for business include the Pare, Chagga, Kinga and Nyakyusa ethnic groups. These mainly stay in town centres like Ifakara, Malinyi, Mlimba, Mngeta, Mtimbira and Lupiro. In remote villages, the main migrants are from the three major pastoral groups; the Sukuma, Maasai and Barbaig. Of these, migrants of interest in this study are the Sukuma who are traditionally both pastoralists and agriculturalists (Madulu, 1998). Unlike other hostile pastoral groups; the Sukuma have shown to be friendlier to the natives as they also share some of the livelihood activities with their hosts like agriculture and petty business. In the beginning the valley seemed potential for such activities because of ample grazing land, fertile land for agriculture and good environment for small and medium enterprises, however currently the situation has changed. The main economic commodity in the valley is rice which is both, the food and cash crop. Cotton used to be the cash crop in the valley, but stopped in mid 1990s due to market failure.

In recent years, however, there has emerged a recurring problem of food insecurity among rural households in the valley. The insecurity is transitory but acute in the months of October to late April, adversely affecting the human capital Chamwali (2000). According to his study Chamwali points out that about 62.5% of households in the valley were below poverty line in the last decade. The poverty is attributed to small scale farming of food crops, absence of cash crops, and environmental degradation. The above study also noted that although 95% of the indigenous population in the valley depend on agricultural products, only 36% of the labour force is involved in the subsistence agriculture with low

productivity. Lack of agricultural capital, loss of soil fertility, drought or floods and price seasonality are the causes of poor productivity.

Since agriculture in the valley is mainly rain fed, the change in precipitation patterns has been another blow. The rainfall used to be bimodal two decades ago, but has changed into unimodal in recent years, starting from late November to mid May every year (Kangalawe and Liwenga, 2004). The disappearance of *vuli* rains has created a considerable gap in the valleys food base. The rains were important for production of maize, which was harvested in February, only two months before the start of the main harvest season of rice. The *vuli* rains are known to contribute up to 30 percent of crop production in bimodal areas hence replenishing household stocks and increase food supplies in markets thus reducing demand from the market and stabilizing food prices (URT and USAID, 2011). Nowadays the rains are either too much within short period, causing floods or are too little causing drought. The rainfall pattern is sometimes confusing as one part of the valley may receive enough downfall while another part receives scant rains.

The rapidly growing rice business in urban centres like Ifakara has now been detrimental to food security as it exhausts the valley's food base within few months after harvesting, which is a big threat to poor households in the valley. Kato (2007) showed that the peasants are compelled to oversell their produce at harvesting time so as to meet pressing cash needs. The peasants fail to repurchase food later in the season because the price will then have doubled or even tripled. However, there are other households which borrow money from traders and agro-pastoralists during farming season so that they repay the loans at harvesting time. The terms of transfer/exchange are such that they exploit peasants, because although the borrowing is done during farming season when the price of rice is very high, the payment is done at harvest prices.

In these terms, a loan of Tsh.140 000/= which is enough to buy one bag of paddy at the time of borrowing, will cost the borrower to sell more than three bags of rice when paying at harvesting prices.

While this is a problem to poor peasant households, it isn't a threat to most agro-pastoral households who can sell small animals like sheep and goats, to get the money for the cash needs like topping up for agricultural inputs, medical expenses, food and other needs. Such money is sometimes given to petty traders, who in turn lend it to the peasants for in kind repayment of rice during harvesting time. The repayment is to be done regardless of whether peasants have had enough harvest or not. In response to this context of vulnerability, the two livelihood communities in the valley adopt different livelihood strategies streamlined by their respective asset endowment. In this respect, it is also expected that the two communities will experience different livelihood outcomes, in which food security is an important aspect.

1.2 Problem Statement

Coexistence of the two major livelihood systems in Kilombero valley creates pressure to the ecology, causing vulnerability and reduced productivity. This affects households differently depending on the level of resilience or vulnerability. Resilience is the function of livelihood capital asset endowment and the position of the household in the legal, political and social fabrics of a society (Frankenberger *et al.*, 2000). The immigrants occupy barren lands unsuitable for agriculture and have large herds of livestock which require vast lands for grazing. On the other hand, indigenous people have the land, but lack producer goods like draught-oxen, animal manure and other physical capitals. In either case, there is a threat to survival in terms of food insecurity. It shows therefore that one livelihood group is potentially dependent on the other. The assets endowment of one livelihood group complements the endowment of the other livelihood group.

Studies show that such elements of complementarities between the two livelihood systems are normally not exploited for improving attainment of outcomes (Msuya, 2009). Instead, members of one community attribute their problems to the presence of other communities thus mounting enmity, instead of exploiting synergies which exist between them. This is the origin of conflicts of interest between competing livelihood groups in the country, including the Kilosa killings of the year 2000 and that of Ikwiriri - Rufiji of 2012. This study intended to undertake livelihood analyses of migrant and non-migrant communities in Kilombero valley, comparing livelihood strategies of each group and their related food-security outcomes. The analysis revealed how the livelihood of one group is impacted upon by the presence of livelihood activities of another group operating in the same livelihood ecology.

1.3 Justification of the Study

The existence of the two resource competing livelihood systems creates pressure to the valley's ecology leading to depletion of its resource base and reduced productivity. The outcome of this situation is that the wellbeing of farmers who own weak assets will be affected first before that of the livestock herders. Although livestock is an important asset to both communities, their presence in large numbers in the valley may adversely affect the indigenous hosts due to land use change, pollution of water sources, and the general environmental degradation caused by the unsustainable livelihood strategies new to the valley's ecology. This is claimed to predispose the indigenous people to livelihood shocks, risks and fragility leading to failure in attaining livelihood outcomes.

According to CARE (2000), to determine whether households are successful in pursuing their livelihood strategies, it is important to look at a number of outcome measures that capture need or well-being satisfaction. Food security status is often considered to be one

of the best outcome indicators of overall livelihood security, since it affects other dimensions such as productivity, healthcare and education. Poor or constrained livelihood strategies of households in the valley are among the reasons for food failure. In the TDHS report of 2010, children's nutrition status is mentioned as the key determinant of future potential and is associated with higher cognitive development and schooling outcomes (NBS, 2010). Therefore this study helps to identify how the livelihood strategies of one community impact its own food security and the food security of the other community.

Resource use conflicts are based on the assumption that the failure of one party to achieve the well-being satisfaction is caused by another competing party. The study also helps to uncover any symptoms of tension between peasants and the livestock herders, hence alerting authorities in the valley to take appropriate preventive measures so as to avert possibilities of violence like those which have taken place elsewhere (Starkey *et al*., 2002; Luwanda, 2008; Kajembe *et al*., 2003; Mung'ong'o and Mwamfupe, 2003). It is worried that the threat of food insecurity is what leads to these conflicts. Furthermore, the study findings, among other things, flags potentials for socio-cultural and social-economic synergies between native peasants and the agro-pastoral immigrants, for improvement of wellbeing through sustainable and collective use of available resources.

This is why the study compares food and nutrition security of households between the two communities in the valley. Food security is the most important livelihood outcome among the poor. The study also capitalizes on the comparison of entitlements to social services or public assets between the two communities. The study informs achievements made towards attaining targets of MKUKUTA, Vision 2025, and the MDGs in the valley as regards to food and nutrition security.

1.4 Objectives

1.4.1 General objective

The overall objective of the study was to undertake livelihood analyses of migrant and non-migrant communities in Kilombero valley by comparing their livelihood strategies and the resulting food security outcomes.

1.4.2 Specific objectives

(i) To identify livelihood strategies pursued by the Sukuma agro-pastoralists and indigenous peasants in the study area.

(ii) To compare the households' asset endowment of the two communities, and the institutional context surrounding their access and use.

(iii) To compare the extent of food availability and dietary diversity, among households of the two communities.

(iv) To determine nutrition status of children under the age of five years, in the two communities using anthropometric methods.

1.5 Research Questions

Specifically, the study was intended to answer the following main research questions:

1. How different are the two communities in terms of livelihood asset endowment?

2. Are there differences linked with livelihood strategies they pursue?

3. What are the political and institutional contexts surrounding their livelihood performance?

4. What are the differences (and/or similarities) between migrant and non-migrant communities in the Kilombero Valley in terms of food security outcome?

1.6 Conceptual Framework Guiding the Study

The framework for organizing ideas in this study borrows from the DFID sustainable livelihood framework (DFID, 1999). In this framework, livelihood is a combination of assets, activities and outcomes in a cyclic relationship. The transformation of assets into livelihood outcomes through human strategies and activities is however influenced by agents, external to the household itself, called transforming structures and processes (Fig. 1). These mediate or influence the strategies of individuals and households in accessing and converting assets into livelihood outcomes as shown in Fig. 1.

Transforming Structures & Processes
- Village government
- Ward Development Councils
- SACCOS or credit groups
- Community groups
- Structural Adjustment Programmes
- Wildlife conservation policy
- Institutions (formal & informal)

Vulnerability Context

- Floods
- Drought
- Human diseases
- Livestock diseases
- Population change
- Dependency rate
- Price seasonality and fluctuation
- Environmental degradation

Livelihood Assets

- Education/skills
- Ability of labour
- Livestock
- Land
- Roads/transport
- Wildlife
- Credit group membership
- Water bodies

Influence & access

Livelihood strategies

- Agric intensification / extensification
- Fishing
- Selling cattle/milk
- Casual labour
- Petty trading
- Migration
- Collection of Wildlife and Forest products

In order to achieve

Livelihood Outcomes

- **Improved Food and nutrition security**

Figure 1: **The conceptual framework**
Source: Adapted from DFID's Sustainable Livelihood Framework (1999).

The transforming structures and processes have a role on the elements of vulnerability context. Institutions like policies, laws and cultural taboos can be used to enhance environmental protection and control degradation which in turn reduces vulnerability. Cultural values which promote e.g. fertility may increase population change, hence

dependence rate. Governments at village, ward or district levels may enact bylaws to control anthropogenic practices on the environment, which may lead to floods, drought, disease outbreaks, price stability etc. These will increase choices of the people, hence reduce vulnerability. This relationship is indicated in the diagram above, by the back arrow connecting the transforming structures and processes box and the vulnerability context box. Likewise, attainment of livelihood outcomes may have impact on the asset base of the people or community. The feedback arrow joining livelihood outcome and livelihood assets suggests this relationship. In the above case, it is apparent that famine in the household or community will trigger copping and survival strategies which erode the asset base. Food secure households will have most of their incomes spared for accumulative strategies which increase assets.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definition of Key Concepts

Eight key concepts in this study have been defined in this section as follows:

2.1.1 Livelihood

Livelihood is defined as comprising assets and activities, and the access to these, mediated by institutions and social relations that together determine the living of an individual (Ellis, 2000). Chambers and Conway (1992) define livelihood as comprising capabilities, assets and activities, required for a means of living. Concern (2003) defines livelihood as a means by which a person or household makes a living over time. In the light of the above definitions, livelihood can be summarised as comprising assets, activities and factors that mediate access to these assets and activities which determine a living of an individual or household. A livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provides sustainable livelihood opportunities for the next generation and if it contributes net benefits to other livelihoods (Chambers and Conway, 1992).

2.1.2 Livelihood strategies

Activities adopted by people of a given community or household to earn a living depends on livelihood resources or assets available. How people access and use these assets, within the social, economic, political and environmental contexts, form a livelihood strategy (UNDP, 2005). The range and diversity of livelihood strategies are enormous. An individual may take on several activities to meet his/her needs. One or many individuals may engage in activities that contribute to a collective livelihood strategy.

Within households, individuals often take on different responsibilities to enable the sustenance and growth of the family. According to Swift (1998), livelihood strategies are composed of various activities undertaken by the household to generate a living. They are an intrinsic part of the overall livelihood process; the assets-activities-outcomes cycle. Swift classifies rural livelihood strategies into agricultural intensification/extensification, livelihood diversification and migration.

2.1.3 Agricultural intensification/extensification

The agricultural intensification or extensification leads to continued or increasing dependence on agriculture, either by intensifying resource use through the application of greater quantities of labour or capital for a given land area (intensification), or by bringing more land into cultivation or grazing (extensification). Whether a household pursues intensification or extensification will depend on the agro-ecological potential (e.g. fertility of soils) and the implications for labour and capital (Scoones, 1998; Swift, 1998).

2.1.4 Livelihood diversification

Diversification may involve broadening the range of on-farm activities (e.g. adding value to primary products by processing or semi-processing them), or to diversify off-farm activities by taking up other jobs. It may be undertaken by choice for accumulation or reinvestment purposes, or of necessity either to cope with temporary adversity or as a more permanent adaptation to the failure of other livelihood options. Studies show that while diversity of income sources is prevalent across different income classes, the nature of this diversification differs greatly between better off and poorer households. The better off tend to diversify in the form of non-farm business activities (trade, transport, shop keeping, brick making etc.) while the poor tend to diversify in the form of casual agricultural wage work, especially on other peoples farms. Diversification by the poor

tends to leave them still highly reliant on agriculture; while that by the better off reduces such dependence (Ellis and Allison, 2004).

2.1.5 Livelihood assets

Assets are often represented as a pentagon in the sustainable livelihood framework, consisting of the following five categories: natural resources (also called natural capital), physical productive goods (physical capital), monetary resources (financial capital), manpower with different skills (human capital) and social networks of various kinds (social capital). The human capital includes labour power, health and nutritional status, skills and knowledge. Natural capital is access to land, water, wildlife, flora and forest while social capital refers to those stocks of social trust, norms and networks that people can draw upon to solve common problems. It is mediated through kin, networks and group membership.

Examples of physical capital are ownership of houses, vehicles, agricultural equipment, livestock, and bicycles whereas financial capital involves money savings, gold/jewellery, access to regular income, net access to credit and insurance. Increasingly, it is being recognized that in addition to these five categories, it is important to include analysis of political capital. This goes beyond social capital, in that, an individual's stock of political capital will determine his/her ability to influence policy and the processes of government. An understanding of political capital is important in determining the ability of households and individuals to claim rights to assistance after a disaster or shock (FAO and ILO, 2009).

2.1.6 Vulnerability

According to Chambers (1989), vulnerability refers to exposure to contingencies and stress, and difficulty in coping with them. The means of resistance to vulnerability are the assets and entitlements that individuals, households, or communities can mobilise and manage. Frankenberger *et al.* (2000) refer to vulnerability as being closer to poverty, marginalisation or similar concepts of disadvantaged and deprivation. It is a characteristic of sets of households that have inadequate existing livelihood strategies. Vulnerability arises out of every day conditions that people live under as a result of their livelihood opportunities. Households are exposed to risks that can disrupt and alter their assets and their income strategies, forcing them to cope and or suffer from shocks. Therefore the more assets people have, the less vulnerable they are, and the greater the erosion of people's assets, the greater their insecurity/vulnerability.

2.1.7 Livelihood outcomes

Livelihood strategies aim to achieve livelihood outcomes. According to Serrat (2008), potential livelihood outcomes can include more income, increased well-being, reduced vulnerability, improved food security, more sustainable use of the natural resource base, and recovered human dignity. The livelihood outcomes are made from livelihood resources/assets shaped by the prevailing social organisation and processes. The state not only provides services, but also provides safety-nets, changes policies and can limit freedoms that can have positive or adverse effects on livelihood systems. To determine whether households are successful in pursuing their livelihood strategies, it is important to look at the number of outcome measures that capture need or well-being satisfaction. Nutritional status is often considered one of the best outcome indicators for overall livelihood security, since it captures multiple dimensions such as access to food, healthcare and education. Other livelihood outcomes that should be measured include

sustained access to food, education, health, habitat, social network participation, physical safety, environmental protection as well as life skills capability. Analysis of these outcomes should not only determine what needs are currently being met, but also what trade offs are there between needs. In addition, the analysis should determine the synergistic relationships between outcome measures (Frankenberger *et al.*, 2000).

2.1.8 Dietary diversity

Also known as dietary variety is defined as the number of different foods or food groups eaten over a reference time period, not regarding the frequency of consumption. Dietary diversity is a measure of household food access and food consumption. It can be triangulated with other food-related information to contribute towards providing a holistic picture of the food and nutrition security status in a community or across a broader area (Wiesmann *et al.,* 2008). It can be measured quantitatively in terms of dietary diversity score.

The household dietary diversity score (HDDS) is meant to reflect the economic ability of a household to access a variety of foods. Studies have shown that an increase in dietary diversity is associated with socio-economic status and household food security in terms of energy and nutrient availability (Hoddinot and Yohannes, 2002).   Food group is defined as aggregating food items that have similar caloric and nutrient qualities. Food item can not be further split into separate foods. However generic terms like fish or poultry are generally considered to be a food item in some studies. Condiments constitute a food group that is generally eaten in small quantities often just for flavour. An example would be spices, a tea spoonful of milk in a cup of tea, a pinch of fish powder added in vegetable, etc.

2.2 Institutional Context of Livelihoods

Livelihood strategies and outcomes are not just dependent on access to capital assets, or constrained by the vulnerability context, but they are also mediated by the external environment. Structures are the public and private sector organizations that set and implement policy and legislation, deliver services, purchase, trade, and perform all manner of other functions that affect livelihoods (Monde, 2003). An enabling institutional environment and policy makes it easier for people to gain access to assets they need for their livelihoods. A disabling policy and institutional environment may discriminate against them, thus making it difficult for them to get access to land, livestock, capital and information (FAO and ILO, 2009). Processes and institutions comprise the laws, regulations, policies, operational arrangements, agreements, societal norms, and practices that, in turn, determine the way in which structures operate. Policy-determining structures cannot be effective in the absence of appropriate institutions and processes through which policies can be implemented (Serrat, 2008).

Processes and institutions are important to every aspect of livelihoods. They provide incentives that stimulate people to make better choices. They grant or deny access to assets. They enable people to transform one type of asset into another through markets. They have a strong influence on interpersonal relations. One of the main problems the poor and vulnerable face is that the processes which frame their livelihoods may systematically restrict them unless the government adopts pro-poor policies that, in turn, filter down to legislation (*ibid*). Other examples of institutions are formal membership organizations such as cooperatives and registered groups, informal organizations such as exchange labour groups or rotating savings groups, political institutions such as parliament, law and order or political parties. Other examples are economic institutions such as markets, private companies, banks, land rights or the tax system, and socio-

cultural institutions such as kinship, marriage, inheritance, religion or draught oxen sharing.

2.3 Dimensions of Food Security

Food security is the situation whereby all people at all times have both physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life (NBS and WFP, 2010). The National Nutrition Strategy defines Household Food Security as the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household (URT, 2011). An assessment of these definitions, entail three interrelated concepts contributing to food security attainment in a household which are: the availability of food; the household access to food; and the individual utilization of the food.

Food availability refers to the amount of food physically available to a household (micro level), or community (macro level), through all forms of domestic production, imports, reserves and food aid. However, according to entitlement theory, food availability does not ensure food security (Sen, 1981).

Food access depends on the physical (e.g. road network, market) and economic (e.g. own production, exchange, purchase) ability of a household to acquire adequate amounts of food throughout the year. Food can also be accessed through transfers by the government or aid agencies, or it can be accessed through remittances from friends or kin relationships.

Food utilization refers to the intra-household use and distribution of the accessible food and the individual's ability to absorb and use nutrients. The distribution of food among members of the household is dictated by family manners, cultural values, taboos and norms. Food utilization in the body refers to

the assimilation of the eaten food items, which depends on hygienic standards, individuals health status and the quality of the food itself. Intra-household misuse of accessed food may include unnecessary ceremonial uses, brewing, excessive sale, processing loses and food remainders.

The World Bank defines food security as access by all people at all times to enough food for an active, healthy life (World Bank, 1986). From the World Bank's definition of food security, the key-defining characteristic of household food security is secure access at all times to sufficient food. The main elements to consider are sufficiency, access, security and time. According to Maxwell and Frankenberger (1992), this aspect of food security has been presented in different ways, namely, as a minimum level of food consumption, as a target level, and as enough food to meet nutritional needs. The World Bank (1986) refers to 'food sufficiency' as enough food to supply the energy needed for all family members to live a healthy, active and productive lives. Their main concern is calories (not protein or micro- nutrients) of individuals in each family. Analysts operate on the principle that other needs are usually satisfied when calorie intake is satisfactory. However, the needs are defined not just for survival, but for an active healthy life.

The second aspect of food security, namely 'access', refers to whether individuals and households have the means to acquire sufficient food. Access to food is possible via production or via the earning of income to be exchanged for food. In the entitlement framework provided by Sen (1981), food security results from endowments (ownership of resources) and not "from food availability". Sen's entitlement framework provides a systematic approach to the definition and assessment of food security. He argues that, lack of food availability is neither necessary nor sufficient to create hunger but lack of ownership of resources that can be transformed into adequate food is what matters.

According to him, hunger can occur in abundance of means of production when people's access to resources is reduced.

The third aspect of food security is that of 'security', which refers to the reliability of access to enough food, or the ability of household food systems to resist crises threatening to lower the achieved level of food consumption. Since 1970, the notion of risk has been central to the definition of food security. Household food security is threatened when the risk of food shortages in the event of crop failure, natural and other disasters, such as fluctuations in production prices is high. Drought, for example, affects the capacity of a household to turn productive assets into a command over food. But that risk is lessened in households that have access to alternative resources. For example, access to irrigation facilities will lessen the risk of drought. Thus the risk profile of individual households is determined by the assets available to them as buffers. The entitlement failure results in reduced dietary intake, which in turn affects the nutritional status of individual household members. Therefore, secure access to enough food to meet household food needs is a necessary condition for good nutritional status. Finally the aspect of 'time' in the concept of food security refers to endurance of the access to enough food.

2.4 Chronic and Transitory Food Insecurity

While adequate food at all time is important for all members, it is necessary to identify the extent of food insecurity. Maxwell and Frankenberger (1992) make a distinction between chronic and transitory food insecurity. The former results from continuous high risk or inability to meet the food needs of household members. The latter occurs when a household faces a temporary decline in the security of its entitlement, and the risk to meet its food needs is of short duration, because of unforeseen and unpredictable circumstances.

In other words, food security does not mean having enough food for short or long periods of time, but having enough food at all times.

According to the World Bank (1986), chronic food insecurity is a continuously inadequate diet caused by the inability to acquire food. This type of food insecurity affects households that persistently lack the ability either to buy enough food, or to produce their own food. Transitory food insecurity on the other hand, is a temporary decline in a household's access to enough food. This condition results from instability in food prices, food production, or household incomes. It can also be a result of lack or loss of purchasing power of the people. In its worst form it produces famine.

2.5 Livelihood Strategies and Household Food Security

Livelihood strategies can be divided into survival, coping, adaptive and accumulative strategies depending on the prevailing circumstances. Each of the categories has impact on the household food and nutrition security.

(a) Accumulative strategies

These are strategies which increase consumption outcomes and stocks of assets in response to opportunity. This increases stock of assets which in turn increase flexibility across asset base. The outcome of this is more income, improved nutrition and increased livelihood security (Morris *et al.,* 2001).

(b) Adaptive strategies

These are such strategies which seek to spread risk of consumption failure in response to anticipated adverse trends. This may be through the intensification of existing livelihood strategies or by diversification into new activities. Households employing such strategies

are said to be resilient and are likely to recover its economic access to food after the shock or disaster ceases. Activities involved in this category are extensification e.g. cultivating more land, on-farm and off-farm diversification e.g. change in cropping mix, wage labour, intensification of cash cropping, investments in social capital or migration. These activities lead to consumption smoothing, risk reduction and risk spreading (Morris *et al*., 2001).

(c) Coping strategies

These strategies are meant to absorb the impact of an adverse shock by drawing down assets and reducing consumption. Coping strategies are characterized by intensified sale of livestock and making informal claims e.g. through kin networks. Activities include piecework, agricultural labour, temporary migration and withdrawing children from school so as to contribute labour. The outcomes are reduced quantity, quality and frequency of meals which affects food and nutrition security of household members. Reduction of unnecessary social and ceremonial obligations can also be considered as a coping strategy. Prolonged coping may lead to survival strategies.

(d) Survival strategies

With survival strategies, consumption is desperately reduced, and household assets are extensively and irreversibly eroded, in an attempt to ward off destitution and death. It may involve sale of productive assets e.g. land and sale of household effects such as bed, mattress etc. Illegal conduct, begging and permanent out-migration are inevitable. The ultimate outcome is starvation and destitution.

2.6 Food and Nutrition Security: A Cause and Outcome of Poverty

Food and nutrition insecurity and poverty are closely interlinked in a vicious cycle. Hunger perpetuates poverty, since it prevents people from realizing their potential and making contributions to the progress of their societies. Poor households and individuals are unable to achieve food security, have inadequate resources for care and are not able to utilize (or contribute to the creation of) resources for health on a sustainable basis.

Hunger makes people more vulnerable to diseases. It leaves them weak and lethargic, reducing their ability to work and provide for their dependents. The same devastating cycle is repeated from generation to generation and this will continue to be so until effective action are taken to break it. Reducing malnutrition is a cornerstone in reducing poverty. Taking the view that nutritional well-being is a pre-condition for development one can argue that lack of productivity is partly a result of malnutrition. The nutritional well-being of the poor is thus not merely an outcome of development, but a pre-condition for it (Weingärtner, 2005).

Improved adult nutrition leads to higher physical productivity and higher national economic growth rates (WFS 1996; von Braun *et al.,* 1998, cited by Weingärtner, 2005). Under-nutrition has severe consequences in the economic and social development of people and countries. It is estimated that at least 50% of diseases are caused by malnutrition and more than one percent of the economic growth of the world economy is reduced due to malnutrition. On the other hand, under-nutrition results in substantial productivity losses through e.g. reduced physical and mental capacity, and high morbidity. Malnutrition therefore has effects on the future generations (Weingärtner, 2005).

Following the economic importance of food and nutrition security, the government of Tanzania in its Kilimo Kwanza mission (URT, 2009b), continues to increase subsidy in agricultural inputs like fertilizer, pesticides and improved seeds in regions of high productivity, including Iringa, Mbeya, Ruvuma, Rukwa and Morogoro. The government also has removed import duty for agricultural machinery to enable farmers mechanise agriculture in the country. The main aim is to transform agriculture and increase productivity and eventually manage to attain the ambitions of food self sufficiency as proclaimed in the Vision 2025, and the Millennium Development Goals.

2.7 Measurement of Food and Nutrition Security at Macro, Meso and Micro Levels

2.7.1 Overview

Food and nutrition insecurity at different socio-organisational levels are caused by different factors and requires specific measurement processes and solutions. Measures to assess the availability of food at the macro level are different from those used at the meso or micro levels and therefore the assessment instruments related to the different categories of food and nutrition security at each levels are also different (Weingärtner, 2005).

(a) Macro level

Precipitation records can be used to predict future food production. Food balance sheets provide information on food availability at national level. The World Food Programme (WFP) developed the Vulnerability Analysis and Mapping (VAM) project to analyse the vulnerability to food insecurity of target populations. A prominent part of VAM is related to access to food. The Demographic and Health Survey (DHS), provides health data for many countries to help them design their national policy. FAO has developed the Global Information Early Warning System (GIEWS) which collects data related to temporary food insecurity. Under the leadership of WHO, several health surveillance systems have

been developed and implemented to monitor the epidemiology of various forms of malnutrition and of selected diseases (Weingärtner, 2005).

(b) At meso level

At the meso or sub-national level, food market surveys provide data on the availability of food. Qualitative surveys, such as focus group discussions, provide information on accessibility to food for those in greatest need. Health surveys describe health conditions that may reflect food utilization problems.

(c) At micro level

At community, household and individual levels, agricultural production surveys, food frequency interviews, immunization surveys and anthropometric surveys of children under five can be used to assess the availability, accessibility, use and utilization of food and its stability at the micro level (*ibid*).

2.7.2 Most common Food and Nutrition Security indicators at macro, meso and micro levels

At macro/national level, food availability depends on supply and demand. Therefore, data on the production of different food commodities, food prices and per capita food consumption are indicators for national food accessibility. The rates of stunting, wasting and underweight in children, low Body Mass Index (BMI) in adults, and low birth weight are indicators that designate the extent to which food is adequately being used and utilized and converted into a satisfactory national nutrition situation. Fluctuations in food prices and regional shortages of food availability or accessibility are sensitive indicators for national food and nutrition instability.

At the meso or community level, delayed harvest time and reduced staple food production are indications of reduced food availability whereas food prices are sensitive indicators for accessibility (Weingärtner, 2005). Types of sewage disposal and diarrhoeal diseases rates provide information on the effectiveness of food utilization. The comparison between pre and post harvest food availability and accessibility as well as chronic energy deficiency of women (low BMI) indicate temporal food and nutrition insecurity. At household level, lack of stored food and the consumption of wild foods are indicators for reduced food availability. A reduced number of meals per day and increased rate of under or unemployment may indicate low food accessibility. Appearances of wasting, goitre or anaemia among household members are outcome indicators of reduced food utilization at household or individual level. Finally, changes in pre-harvest food consumption practices and migration may be sensitive indicators for temporal food insecurity (*ibid*). Table 1 shows examples of most common food and nutrition security indicators at different social and administrative levels.

Table 1: **Food and nutrition security indicators**

Social Level	Availability	Accessibility	Use and Utilization	Stability
Macro/National	Food production, fertility rate, population flows	Food price, wages, per capita food consumption	Stunting rate, wasting rate, low body weight rate	Food price fluctuation, regional gaps
Meso/community	Harvesting time, staple food production	Market and retail food prices	Latrines availability and use	Pre/post-harvest food losses, women's BMI
Micro (i.e. household or individual level)	Food storage, consumption of wild foods	Dietary diversity, food frequency, Employment rate	Weight-for-age, goitre and anaemia rates	Pre-harvest food practices, extent of migration

Source: Weingärtner (2005)

2.7.3 Indicators of household food security

Household food security indicators can be divided into three main categories, which are food consumption indicators, anthropometric indicators and livelihood indicators. Food consumption indicators are measured by number of meals per day, number of calories consumed, household percentage of expenditure on food and dietary diversity, which can be estimated through different ways according to the specific context and available data (Weingärtner, 2005). Anthropometric indicators are measured by the prevalence of stunting which is a relation called height-for-age; wasting, which is a relation called weight-for-height; and underweight which is a relation called weight-for-age. Other measurements include mid-upper arm circumference (MUAC), body mass index (BMI) and the sub scapular skin-fold.

Livelihood indicators are measured in terms of assets owned, feeling of insecurity, price of food, employment and health. The choice of indicator depends on the purpose of the exercise. For example, when the purpose is to monitor food security in its complexity in order to predict potential food crises arising from one of these factors in one specified nation or region, it is essential to take all the above indicators into account. But if the objective is to discover the general explanatory capacity of selected variables, such as education or consumption patterns of rural people on a phenomenon such as household food security in rural areas, a different analysis can be carried out. This suggests the possibility of using a less detailed indicator, which might be based on only one category e.g. anthropometry, but which would constitute a good proxy for household food security (Burchi, 2007). Support for using anthropometric indicators such as prevalence of stunting or underweight is that they reflect human deprivations. Scholars in food security argue that, since our ultimate concern is with the nature of the lives that people can lead, there is

a case for going straight to the prevalence of under-nourishment, rather than to the intake of calories and other nutrients (Anand and Sen, 2003).

2.7.4 Dietary diversity as a measurement of food security

Obtaining detailed data on household food access or individual dietary intake can be time consuming and expensive, and requires a high level of technical skill both in data collection and analysis. Dietary diversity is a qualitative measure of food consumption that reflects household access to a variety of foods, and is also a proxy for nutrient adequacy of the diet of individuals (Kennedy *et al*., 2011). The dietary diversity questionnaire represents a rapid, user-friendly and easily administered low-cost assessment tool. Scoring and analysis of the information collected with the questionnaire is straightforward. The dietary diversity score to be used may consist of a simple count of food groups that a household or an individual has consumed over 24 hours preceding the day of survey.

2.7.5 Validation of dietary diversity as indicator of micronutrient intake and food security

Various studies have shown that Dietary Diversity Score (DDS) is a convenient and cost efficient indicator that can measure changes in the micronutrient status of vulnerable populations. Kennedy *et al*. (2007), demonstrated that DDS based on simple count of food groups can be used to predict the probability of adequate micronutrient intake in young non-breast-feeding children. In their findings using 24 to 71 months old non breast feeding Filipino children, DDS was found to be a significant predictor of micronutrient intake in which the Pearson's correlation coefficient between the mean probability of adequate nutrient intake (MPA) and DDS was significant ($p<0.001$). Other similar studies conducted in Kenya, South Africa, and Mali also found significant correlations between

DDS and nutrient intake, with correlation coefficients of 0.39 in Mali, 0.32 in Kenya and 0.64 in South Africa (Hatloy *et al.,* 1998).

Likewise Ruel (2003), in her study "Operationalising Dietary Diversity" reports that studies validating Dietary Diversity against nutrient adequacy in developing countries, confirm the well-documented positive association between dietary diversity and child growth in a number of countries. Ruel documents that evidence from a multi-country analysis (ten countries were involved) suggests that, household-level dietary diversity is strongly associated with household per capita income and energy availability, suggesting that Dietary Diversity could be a useful indicator of food security (defined in terms of energy availability). A consistent positive association between dietary diversity and child growth is also found in a number of countries. A further useful contribution of her study is the comparison of the two diversity measures in a regression analysis which shows that Dietary Diversity Score based on food groups is a stronger determinant of nutrient adequacy than Food Variety Score (FVS) based on individual foods.

2.8 Anthropometry

Anthropometry is the measurement of body size and gross body composition. The basic principle is that prolonged or severe nutrient depletion eventually leads to retardation of linear (skeletal) growth in children, and to loss of, or failure to accumulate, muscle mass and fat in both children and adults. These problems can be detected by measuring body dimensions such as standing height, mid-upper-arm circumference (MUAC) or total body mass (weight). All of these are expected to vary by the age of the person measured and by their sex, so that there is a need for the measurements to be standardised for age and sex before they can be interpreted. Computer softwares are available to perform the transformation e.g. Nutri-survey, Anthro and Epi-Info softwares.

2.8.1 Height-for-age

This index provides an indicator of linear growth retardation and cumulative growth deficits in children. Children whose height-for-age z-score is below minus two standard deviations (HAZ <-2 SD)[1] from the mean or below 80% of the median of the standard reference population, are considered short for their age (stunted), or chronically malnourished. Children who are below minus three standard deviations (HAZ<-3 SD) or below 70% of the median, are considered severely stunted. Stunting reflects failure to receive adequate nutrition over a long period of time and is affected by recurrent and chronic illness. Height-for-age, therefore, represents long-term effects of malnutrition in a population and is not sensitive to recent, short term changes in dietary intake (TFSNAS, 2012).

2.8.2 The weight-for-height

This measures body mass in relation to body height or length and describes current nutritional status. Children with Z-scores below minus two standard deviations (WHZ<-2SD) are considered thin (wasted) or acutely malnourished. Wasting represents the failure to receive adequate nutrition in the period immediately preceding the survey and may be the result of inadequate food intake or a recent episode of illness (e.g. diarrhoea) causing loss of weight and the onset of malnutrition. Children with a weight-for-height index below minus three standard deviations (WHZ<-3SD) are considered severely wasted. The weight-for-height index also provides data on overweight and obesity. Children more than two standard deviations (WHZ>+2SD) above the median weight-for-height are considered overweight, or obese.

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[1] The negative sign of SD takes its usual mathematical meaning. Values below (less than) -2SD are -3, -4 etc. whereas values above (more than) -2SD are -1, 0, +1 etc.

2.8.3 Weight-for-age

This is a composite index of height-for-age and weight-for-height. It takes into account both chronic and acute malnutrition. Children with weight-for-age below minus two standard deviations (WAZ<-2SD) are classified as underweight. Children with weight-for-age below minus three standard deviations (WAZ<-3 SD) are considered severely underweight.

2.9 The World food Crisis and the Evolution of the Concept of Food Security

According to Maxwell (2001), the concept of food security has been in the public eye for a long time, but began to make a serious impact on the development debate in the 1970's during the first World Food Conference held in Rome in 1974. Food security was considered in terms of aggregate availability of food at national or regional level. It was assumed that food crisis at household level would manifest itself in malnutrition or under-nutrition. Supply deficits were thus translated directly into a decline in nutritional status.

In the mid-1970s, soon after the first World Food Conference, the global food situation changed remarkably. There were increased aid flows and increased investments in agriculture and rural development. Cereal production and reserves increased considerably, while prices on the market dropped sharply. However, despite this favourable condition, incidences of hunger and under-nutrition remained high (Monde, 2003). These incidences led to re-examination of the causes of hunger and food deprivation. From the analysis, it was learned that the principal food security problem was not a lack of food supply, but rather a chronic lack of access to enough food at the level of vulnerable groups due to a lack of purchasing power, or due to what Sen (1981) called a lack of entitlement to food. These lessons led to a shift in thinking of the way in which food security was

conceptualised. The focus shifted from inadequate supply of food to inadequate access to food.

From 1980 onwards, the primary concern was on households and individuals with emphasis on access, vulnerability and entitlement. Since the 1980s, the concept of food security emerged as a potentially useful development objective. Though it has captured great interest among research institutions, international aid organizations, government agencies and NGOs involved in social and economic development, it has not yet resulted in a common conceptual and methodological understanding of the issues involved. As a result, different individuals and agencies perceive the concept in different ways (Maxwell and Frankenberger, 1992). Later in mid-1980s, researchers realized that food insecurity occurred in situations where food was available but not accessible, because of an erosion of peoples' entitlement to food (Sobhan, 1990).

Sen's work on entitlements influenced this shift in thinking considerably. The entitlement framework actually involves quantifying food to which households have access to from their own production, income, exchanges as well as claims. Hence a number of socio-economic variables have an influence on a household's access to food. This paradigm shift also gave more clarification of the concept of vulnerability. Sobhan (1990) defines vulnerability as defencelessness, insecurity, exposure to risk, shocks and stress, and difficulty in coping with them. The entitlement framework has made much contribution in developing indicators based on a better understanding of the processes that lead to household food insecurity. For example, food supply is no longer taken as the only cause of household food insecurity. Work on food security by Omosa (1998) recognised both food availability and stable access to food as key issues in household food security. Stable access to food depends on whether households have viable means for procuring the food.

When governments and development agencies realised that food insecurity occurred despite food availability, a series of indicators that measured food access were developed. These included socio-economic indicators like household calorie adequacy, income level, food expenditure, household perception of food security (opinions of households regarding their food security status), and storage estimates.

2.10 Current State of Food Insecurity in the World

According to WFP (2012), the world food production globally is sufficient to feed all people in the world, however, there are a number of countries which are not able to provide enough food for their population. Under-nourishment or chronic and acute hungers are still widespread. Most of the World's hungry people live in developing countries. According to the latest Food and Agriculture Organization (FAO) statistics, there are 925 million hungry people in the world and 98 percent of them are in developing countries. The geographical distribution of hungry people in the World is such that 578 million in Asia and the Pacific, 239 million in Sub-Saharan Africa, 53 million in Latin America and the Caribbean, 37 million in the Near East and North Africa, and 19 million in developed countries (WFP, 2012). This means one in every seven people in the world don't get enough food to be healthy and lead a decent life. According to WFP hunger and malnutrition are in fact the number one risk to the health worldwide, greater than AIDS, malaria and tuberculosis combined. Hunger does not only shoulder on the individual but imposes a crushing burden on the developing world. Economists estimate that every child whose physical and mental development is stunted by hunger and malnutrition stands to lose 5% to 10% in lifetime earnings (WFP 2012).

Three-quarters of all hungry people live in rural areas, mainly in the villages of Asia and Africa. Overwhelmingly dependent on agriculture for their food, these populations have

no alternative source of income or employment and therefore vulnerable to natural and anthropogenic crises. FAO calculates that around half of the world's hungry people are from smallholder farming communities, surviving off marginal lands, prone to natural disasters like drought or flood. Another 20 percent belong to landless families dependent on farming and about 10 percent live in communities whose livelihoods depend on herding, fishing or forest resources (FAO, 2010).

An estimated 146 million children in developing countries are underweight - the result of acute or chronic hunger (UNICEF, 2009). Often child hunger is inherited since up to 17 million children are born underweight annually, as a result of inadequate nutrition before and during pregnancy. Women are the world's primary food producers, yet cultural traditions and social structures often mean women are much more affected by hunger and poverty than men. A mother who is stunted or underweight due to inadequate diet often give birth to low birth weight children. According to UNICEF, around 50 per cent of pregnant women in developing countries are iron deficient. Lack of iron means 315,000 women die annually from hemorrhage at childbirth. As a result, women, and in particular expectant and nursing mothers, often need special or increased intake of food (*ibid*).

2.11 Food Security as the World Development Priority

According to Weingätner (2005), it is increasingly being recognized that food security and nutrition are foundations for development. In his study titled "Achieving Food and Nutrition security: Actions to meet the global challenge", Weingätner emphasizes that nutrition status of children is used as one of the key indicators of poverty in the framework of Millenium Development Goals (MDG). He argues that food and nutrition security contribute to the attainment of goal one to goal seven in the MDGs list such that food insecurity endangers the attainment of the goals as follows (UN SCN, 2004):

Goal 1: Eradicate extreme poverty and hunger

Food insecurity and malnutrition erode human capital, reduce resilience to shocks and reduce productivity (impaired physical and mental capacity) due to physical weakness and morbidity.

Goal 2: Achieve universal primary education

Malnutrition reduces mental capacity. Malnourished children are less likely to enrol in school or are more likely to enrol later. Hungry school children are truant who end up being dropouts. Hunger and malnutrition reduces cognitive capacity hence school performance.

Goal 3: Promote gender equality and empower women

Food secure and better nourished girls are more likely to stay in school and, subsequently, have more control over future choices. Women and school girls who are food insecure fall prey to deceitful men who eventually give them unwanted pregnancies and/or HIV AIDS. This is a major contribution to girl's dropouts in schools leading to impoverishment.

Goal 4: Reduce child mortality

Malnutrition is directly or indirectly associated with more than 50% of child mortality. Malnutrition is the main contributor to the burden of disease in the developing world.

Goal 5: Improve maternal health

Maternal health is compromised by an antifemale bias in distribution and allocation of food, health and care. Food insecurity and malnutrition are associated with most major risk factors for maternal mortality. Anaemia, caused by inadequate diet, and malarial infections during pregnancy are among the threats to maternal health.

Goal 6: Combat HIV/AIDS, malaria, and other diseases

Food insecurity spurs coping mechanisms, such as migratory labour and/or prostitution which increases the spread of HIV/Aids. Malnutrition hastens the onset of Aids among

HIV-positive. Malnutrition weakens resistance to infections and reduces chances of survival for those who have malaria.

Goal 7: Ensure environmental sustainability

Food insecurity leads to unsustainable use of forest lands and resources. The efforts of food-insecure households to acquire food may also have important implications for the environment and the use of natural resources. Malnourished people often live in ecologically vulnerable areas, and tend to use land-exploiting agricultural practices in their need for higher food production. This in turn undermines their livelihoods and those of future generations.

2.12 The Tanzania's Recent Food Security Challenges and Responses

The most important challenge to food security among the rural poor is the deepening poverty leading to most communities remaining dependent on small holder subsistence farming. However, poverty and food insecurity have remained deaf to all previous poverty reduction strategies (PRS). In 1999, Tanzania came up with a new development plan known as the National Development Vision 2025, famously known as Vision 2025. In this plan, which proclaim long term national development ambitions, food self sufficiency and food security has been the first goal in realizing vision's target number one which is high quality livelihoods. In 2005 the National Strategy for Growth and Reduction of Poverty (NSGRP), famously known as MKUKUTA[2] in Swahili was conceived. This is a national framework that puts poverty reduction high on the country's development agenda. The NSGRP which came after the adoption of the Millennium Development Goals (MDGs) was meant to operationalise the set goals and targets in both Vision 2025 and MDGs by 2015.

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[2] MKUKUTA *(mkakati wa kukuza uchumi na kuondoa umaskini)*, is a Swahili acronym for the National Strategy for Growth and Reduction of Poverty (NSGRP). A second generation of poverty reduction strategies.

In attaining the MDG, the NSGRP made food security the national target number two; which is halving the proportion of people who suffer from hunger from 28% to 14% by 2010 (URT, 2009b). Nevertheless up to the expiry of the strategic period of five years, this ambition was never been met.

Some scholars attribute this failure to the fact that in operating those strategies, priority was made to the sectors in which majority of the population is not active. This is why despite good figures of growth indicators; no reflection of it is manifested in the people's livelihoods. Contentions of various critics of the PRS suggest that the most relevant priority sector should have been agriculture in which over 80 percent of the population is active (Wangwe, 1996). Although most of the national food base accrues from peasant agriculture, the productivity of these peasants is in turn highly undermined by food insecurity, since a hungry peasant can't be efficient enough to produce surplus which is crucial for economic growth and the general wellbeing.

The government of Tanzania has eventually, but lately, identified the following key constraints to the agricultural sector and to food security in general (URT, 2009a). These include expensive transaction costs related to marketing of food goods due to high transport costs, poor feeder roads and poor storage facilities. Also limited access to credit (to afford input costs) and under investment in productivity enhancing technologies e.g. extension services, use of fertilizers, irrigation schemes, and abolishing hand hoe tillage.

These factors are widely recognized as obstacles in the ongoing transition from subsistence to commercial agriculture. To address these obstacles the government has come up with *Kilimo Kwanza c*ampaign whose overall aim is to mechanize and transform agriculture and make it a lead sector in economic growth thereby improving per capita

productivity and economic growth (URT, 2009a). The nutrition security is a function of the food security components, poor food preparation and social deprivation at the household level. Also poor food storage, the intra household food entitlements and illness, which affect utilization of the food in the body, are sources of nutrition insecurity.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Location and Physical Characteristics of the Study Area

The Kilombero Valley is the largest seasonal low altitude fresh water wetland in East Africa. It is situated in the southern central Tanzania ($8^0 32'$ S $36^0 29'$ E) covering an area of 6,650Km² between the Udzungwa Mountains National Park (UMNP) and the Selous Game Reserve. The main area of the valley straddles along the boarder between the two districts of Kilombero and Ulanga which are separated by the Kilombero River. It is about 40 km wide and 175 km long at an altitude of about 300m above sea level. The valley bottom is very flat with a difference of only 20 metres between the sides and the centre (Starkey *et al*., 2002).

3.2 The Study Population

The traditional people of Kilombero Valley are the Ndamba (meaning people of the river), Mbunga, Pogoro, Ngindo, Bena and Hehe. Recent immigrants include Pare, Chagga, Sukuma, Maasai, Barbaig/Mbulu and Nyakyusa. However, historically all inhabitants of this valley are immigrants from different places of ethnic origins.

In historical times, the Ndamba were the first to enter in the valley. They were closely related with the Pogoro who live in the western part of the valley basin and the adjoining Mahenge highlands. It is said that the Pogoro and Ndamba formerly lived as one tribe in the region of upper Luhombero before they immigrated into the Kilombero valley under pressure from the south (Jätzold and Baum, 1968). According to the above authors, in the second half of the 19th century, two more waves of migrants burst into the valley plain, forcing the Ndamba into the swampy and most inaccessible central parts of the valley.

According to Gulliver (1955), cited by Jätzold and Baum (1968), in 1862 a wave of Ndendeule and other tribes pursued by the war-like Zulu tribe of the Ngoni were pushed up from the south into the northern part of the valley, near the present-day Ifakara. The Ndendeule and others mingled with the Ndamba and Pogoro to form the new tribe of Mbunga who are the dominant native inhabitants of Ifakara and its outskirts. From 1863 onwards, there came the invasion of the Bena via Utemikwira. Crowded by the war-like Hehe, the Bena were pushed down from the Njombe highlands into the south-west of Kilombero valley, constituting the *Bena-Manga* ethnic group under the then *mtema* of Utengule in the current Kilombero district. Towards the end of the 20th century, the Hehe of Iringa highlands penetrated from west into the foothill zone of the great escarpments/ Udzungwa Mountains (Jätzold and Baum (1968). Therefore even the Ndamba who are considered in the valley to have no other origin, they are in fact not traditionally native there.

After a couple of decades, Kilombero Valley started to experience massive migration of livestock and pastoral communities. These recent migrants are from the three major pastoralist groups: Sukuma, Maasai and Barbaig, coming from areas all over Tanzania (Kato, 2007). All the pastoralists had moved into the valley primarily in search of pasture for their cattle. However, the secondary reasons included: good land for crops, moving away from diseases, land shortages and competition from other pastoralists and conflicts with local farmers (Starkeys, 2002). Of the three communities, the Sukuma is now the most dominant and influencing culture in the entire valley. According to Charnley (1998), in her study in Usangu plains, the migrant Sukuma pastoralists use natural resources more intensively than the indigenous people or the Maasai. They tend to have larger families and send few children to school, enabling them to use 'free' family labour for herding

cattle rather than hiring local labour. The result is that they can increase their population and the sizes of their herds more quickly.

According to Starkey (2002), presence of pastoralists and their large numbers of cattle is believed by the indigenous people to cause hard pan of the soil, making it harder to work on, and that pastoralists cut many trees and practice bush clearing for tse-tse fly control, locally reducing fuelwood availability. The Ulanga District Wildlife and Forest Inventory Report (1997) shows that some pastoralists (mostly Sukuma) engage in more burning of vegetation to stimulate the growth of palatable grasses, and also practice charcoal burning which can be a key factor in local deforestation and spread of forest fires. This perception of the indigenous people in the valley suggests that the presence of migrant livestock herders is not very friendly to them and to the environment.

The total population of all the people in the two districts of Kilombero and Ulanga was projected to be 633 099 people in 2011. Due to potentials of economic activities like agriculture, small scale industry, tourism and forestry, the area has a positive net migration of 4.2%, causing rapid depletion of natural resources in the valley. There are about 174 920 people within the valley with birth rate of 3% per year (Mlaponi, 2011). The household size according to 2002 census projections was 4.9 persons per household in the year 2011.

3.3 Climate

The weather of Kilombero can be described as the tropical to sub-humid which is favourable for living. Its weather can be divided into the following: dry seasons from July to August and hot dry seasons from September to November. The temperatures are not constant, there is large fluctuation of the temperatures between day and night. The high

temperatures are in November and December, the low temperatures are observed during the cool dry seasons normally between June and July when temperatures fall to 12° Celsius. On the other hand, 38° Celsius can be reached between November and December. The relative humidity is normally constant during the wet seasons, when it is between 70% and 90%, but during the hot dry seasons it drops down to 25%. The areas of Kilombero Valley have rainfalls of between 1200mm and 1400mm annually. Kilombero is not the windy area, the wind is generally steady, except for October and November (Starkey *et al*., 2002).

3.4 Land for Agriculture

The greatest part of Kilombero Valley consists of alluvial flood plains situated at an elevation of slightly less than 300m above sea level. The valley has about 336 340 hectares of land potential for irrigation, among 434 390 hectares which are potential for irrigation in Morogoro region (URT, 2007). Main crops grown there are rice, maize, cassava, sweet potatoes, sugar cane, pulses, vegetables and fruits. The traditional staple food is rice but now maize has been adapted to. Cotton used to be the traditional cash crop but it is no longer grown in recent years due to microeconomic disincentives. Acquisition of land by the agro-pastoralists is by opening unused lands freely given to them by the government (which is normally barren), and by buying or hiring from the indigenous farmers.

3.5 Research Design

Cross sectional research design was used in which primary data was collected at one point in time. The design is chosen because of time and resource constraints. However, under this design descriptive and relationship between variables can effectively be studied and analysed (Kothari, 2004).

3.5.1 Sampling design

Administratively, the Kilombero Valley is divided into 8 divisions, 4 in Ulanga District and 4 in Kilombero District. Purposive sampling was used to obtain 2 representative divisions and one ward in each division. Two villages in each selected ward were also purposively chosen in consultation with ward leaders based on accessibility and proportionate number of households in both the peasant and agro-pastoral livelihoods which are the target of this study. Fig. 2 shows the sampling process.

Figure 2: **Sampling flow chart**

Random sampling was used to obtain households in the selected villages with village registers of each of the four selected villages serving as sampling frame. The sampling units were the households, and the household head, or if absent, the spouse was the respondent. The total sample size was 104 households, 26 in each village. However the proposed random sampling posed problems in obtaining the agro-pastoral households because the identification of their households was difficult. The village registers (sampling frame) had shorter list of agro-pastoral households than actually present. Therefore systematic random sampling was used for sampling of peasant households while snowball sampling had to be used for agro-pastoral households instead. Overall 104 households were sampled in which 55 were peasants, 18 peasant and petty-traders and 31 agro-pastoral households. Table 2 shows the distribution of sampled households. This makes 8.5% of the total number of 1215 households in the surveyed villages. This is in agreement with scholars documenting that the minimum sample for social study to be carried out is 5% to 8% of the population while a sample of 30 respondents is the minimum number of cases for studies in which statistical data analysis can be done (Boyd, 1981; Bailey, 1998; as cited by Maro, 2008).

Table 2: Number of sampled households in each village

Village	Total households	Sampled households			
		Agro-pastoral	Peasant	Peasant and traders	Total
Minepa	516	3	18	8	29
Mbuyuni	301	9	16	2	27
Ngoheranga	282	11	17	7	35
Mabanda	134	8	4	1	13
Total	**1215**	**31**	**55**	**18**	**104**

Anthropometric measurements were taken from children in one of the mobile RCH clinics in each village. These are Mikoroshini at Mbuyuni village, and Ofisini at Minepa village. Other clinics were Mwembeni at Ngoheranga village and Ikelekele at Mabanda village.

All children attending the clinic were considered whereby exclusion criteria were: age below 6 months, missing clinic card and refusal by the mother. The inclusion criteria were: age between 6 and 59 months, presence of clinic card for verification of age of child, weight above 2.5kg at birth and the consent of mother. Village RCH aides were used to take the measurements and recording was done by the researcher and assistant. A total of 72 children were measured of which 39 were from agro-pastoral households and 33 from peasant households. Table 3 shows the distribution of children from each study village.

Table 3: Number of children measured for anthropometry

Village	Agro-pastoral	Peasants	Total
Mbuyuni	9	5	14
Minepa	3	12	15
Ngoheranga	15	7	22
Mabanda	12	9	21
Total	**39**	**33**	**72**

3.5.2 Methods and instruments of data collection

Both primary and secondary data were collected. Primary data were collected using structured questionnaires and key informants checklists (Appendix B). The anthropometric measurements were collected from children of age of six to fifty nine months. The measurements taken were MUAC (mid- upper arm circumference), height and weight. Their measurements were entered in a specially prepared form (Appendix B).

Instruments used were tape measures calibrated in millimetres for MUAC, weighing scale (SALTER ENGLAND; Model 2356S 25x100g, for UNICEF), anthropometer for measurement of recumbent length and a measuring board (carefully improvised) for measurement of body stature. The anthropometric measurements were taken from the children because they are the most vulnerable to hunger and therefore their nutrition status

forms a good indicator of prevailing food and nutrition situation in a community (Frankenberger *et al.* 2000; Kayunze, 2011). Secondary data collected included dates of birth of household head found in their election cards and children from MCH cards.

3.5.3 Key informants interviews

Semi-structured questionnaire was used to interview opinion leaders including village and ward executive officers of Ngoheranga and Mabanda villages in Ngoheranga ward, also Minepa and Mbuyuni villages in Minepa ward. One ward councillor was also interviewed in Minepa ward and two division officers in Lupiro and Malinyi divisions. Others were technocrats in the agriculture, education and health departments at ward level.

3.6 Data Analysis

After collecting, data was cleaned, sorted and explored for normality ready for analysis. Anthropometric measurements and dietary diversity scores were analysed using MS-Exel and Nutri-Survey (2007-version) softwares, for classification and computation of anthropometric variables i.e. stunting, wasting and underweight. Food security and demographic variables were analysed using SPSS (16). The analysis involved regression, descriptive analysis and t-test for comparison of variable characteristics. Two regression analyses were done in which two dependent variables measuring food security, were each regressed with a number of independent variables.

3.6.1 Estimation of regression model

Selection of the explanatory variables included in empirical models was based on social-economic factors and consumption patterns of the livelihood groups in the ground. The ordinary least square model of the general form as shown in Equation 1 was used.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_i X_i + \varepsilon_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{Equation 1}$$

Where: **Y** = Dependent variable as shown in Table 4

$ß_0$ = Constant,

$ß_1, ß_2, ß_i$ = Coefficients of variables,

X_1, X_2, X_i = Independent variables as shown in Table 4

ε_i = Error term.

The variables and their operational definitions used in the two regression analyses done are summarised in the Table 4.

Table 4: Explanatory variables included in Ordinary Least Square Regression Model

Dependent Variable	Explanation
HDDS	Household Dietary Diversity Score
MONTFAVL	Number of months of food availability in the household
Independent Variables	**Explanation**
AREACULT	Household's total area cultivated in acres
EDUCSPOU	Level of education of household spouse (quantified by number of years of schooling)
AGRLABOU	Agricultural labour as a dummy variable of source of income in the household (coded: 1 = agricultural labour, 0 = not agricultural labour)
WFORCE	Work force (number of working persons in the household)
AGEHH	Chronological age of household head in years
DEPRATE	Household dependence ratio (percentage ratio of number of dependants to total household members)
PEASNT	Peasantry as a dummy variable of household livelihood (coded: 1 = peasant, 2 = not peasant)
FISHING	Fishing activity as a dummy variable of household source of income (coded: 1 = fishing, 0 = not fishing)
EDUCHH	Level of education of household head (quantified by number of years of schooling)

3.6.2 Hypothesized relationships between variables

The following relationships were assumed between the variables described in Table 4. *Source of income* determines the level of income of households. A household with diversified income outside peasant agriculture is likely to be more food secure. Two dummy variables, *fishing* and *selling agricultural labour* were included to capture the impact of income source to level of income hence food security. Therefore, a positive relationship between diversified household income source and food security (both Household Dietary Diversity and number of months of food availability) was expected. The level of education attained by household head or spouse is expected to increase awareness in terms of acquiring, sustaining and utilizing the quantity of food which is nutritionally accepted. A positive relationship between the education of household head and food security was therefore also expected. Chronological age of the household heads also influence food security in that mature people are more prudent and assume greater responsibility to food use than inexperienced young household heads. Thus a positive relationship was expected between age of household heads and the two measures of food security used in this model.

The amount and quality of food consumed at household level depends on the number and age structure of the household members. Overall, a household with high dependence ratio (i.e. more non-productive than the productive members in the household) is economically more burdened than that with low dependence rate. Because there are more mouths to feed than the hands to produce, a negative relationship is expected between dependence ratio and household food security. Since livelihood activities in the valley like elsewhere, has influence on food security of households, being a peasant, a petty trader or agro-pastoralist may be a reason of being food secure or insecure. Therefore peasantry as a dummy variable was included to capture the effect of livelihoods to food security. Because

peasants are more vulnerable to shocks and seasonality, they are prone to livelihood insecurity. Inverse relationship was expected between being a peasant and food security as opposed to not being a pure peasant. Finally, as a rule of the thumb, the more the work force, the more likely the household is food secure. Therefore a direct relationship was anticipated between the number of workforce and food security.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Characteristics of the Sampled Respondents

4.1.1 Household size, number of children and sex

Total number of households surveyed was 104 comprising of agro-pastoral, peasant and mixed livelihoods as shown in Table 5. The agro-pastoral households were of the Sukuma ethnic group referred to as migrants in this study, making about 30% of the sample. The peasant households are of the indigenous/non-migrant people, making 52% of the sample. Other households in the sample were found to be of people who pursue diversified livelihoods i.e. doing farming, trading and petty businesses or fishing. While 20% of indigenous households were female headed (Table 5), all agro-pastoral households were male headed. This may be due to the culture of inheriting wives of deceased relatives among the agro-pastoral community leading to no widowed households.

4.1.2 Education levels, household labour and dependency ratio

The number of people in households differed with livelihood group. The agro-pastoral households had mean household size of 8.4 persons per household while that of peasants had mean household size of 5.16 persons per household. Households pursuing mixed livelihoods constituted the highest proportion of household heads with secondary education (16.7%) as summarised in Table 5. Peasant households had the smallest dependency ratio but 16.6% of household heads with age above 65 years, who may not be very productive. Although the agro-pastoral households had the highest dependency ratio (67.7%) due to large number of children aged below 18 years in the households, they also had more average household labour/work force (2.42 persons per household) compared with other livelihood groups. This can be explained by polygamy and the tradition of

retaining the newly married couples at home for a few years before they can be trusted to establish their own households. Forty five percent of the agro-pastoral household heads had no formal education while 55% had primary education and none had secondary education. The peasants were found to be most literate with the smallest proportion of household heads without formal education (29%).

4.1.3 Cultivated land area

Big difference was shown between peasant and agro-pastoral households in terms of mean cultivated land areas. This is because agro-pastoralists grow variety of crops in big pieces of land. In average the area cultivated by agro-pastoralists was nearly three fold (13 acres per household) compared to that of peasant households, which in average, was only 4.58 acres per household. Cultivation of such large pieces of land was only possible if a household owned animal draught power. Peasants in the valley have not yet adopted the use of animals, which could help to scale up their agricultural production.

Table 5: Demographic and other characteristics of the sampled households

| | N | Mean HH size | Education level | | | Work force | Dependency ratio (%) | Mean area cultivated (acres) | Female headed HH (%) | Male headed HH (%) | Youth headed HH (<40yrs) (%) | HH heads between 41-65 years old (%) | HH heads (>65 years old) (%) | Household average number of children |
			No Education	Primary	Secondary									
Agro-pastoral	31	8.4	14 (45.16)	17 (54.83)	0 (0.0)	2.42	67.7	13	0	100	45.16	51.6	3.2	6
Peasant	55	5.16	16 (29%)	37 (67.27)	2 (3.6)	1.96	58.6	4.58	20	80	30.9	52.7	16.36	3.25
Other	18	5.33	7 (38.9)	8 (44.4)	3 (16.7)	1.89	59.6	5.94	16.67	83.33	44.44	50	5.56	3.33
Total	104	6.29	37 (35.57)	62 (59.61)	5 (4.8)	2.09	61.9	7.84	13.46	86.53	37.5	51.92	10.57	4.19

4.2 Livelihood Strategies of the Sukuma Agro-Pastoral Migrants

Most migrants living in rural areas of the Kilombero Valley were the Sukuma agro-pastoralists. They keep cattle and small animals like sheep, goats and poultry. There are other pastoralists such as the Maasai and Barbaig (*Mbulu*), but are few and sparsely scattered, and most important is that they don't cultivate the land. The Maasai are found in the remote plains of Kivukoni village in Minepa ward whereas the Barbaig are scattered in the remote plains of Ihowanja and Kilosa kwa Mpepo villages along the proposed road to Songea, in the new Ngoheranga division.

4.2.1 Crop cultivation

The Sukuma grow crops like rice, maize, banana, sweet potatoes, simsim and cassava. They occupy poor lands away from main settlements therefore employ agricultural extensification. They cultivate larger pieces of land of mean acreage of 13.065 acres compared with the indigenous people with mean acreage of 4.582 acres as shown in Table 5. Tillage is predominantly by ox-plough while weeding is done by hand. Crop production is an important activity for these agro-pastoralists in the valley. They cultivate rice, maize and sweet potatoes for food and for selling. Table 6 shows that 87% of surveyed agro-pastoral households sell food crops as their main source of income. Land is either bought or freely allotted to them by village governments. However the barren land plots they own do not support all of these crops. Nevertheless, with the use of animal manure, they manage to get a reasonable amount of harvest, but which is not enough to support the household for the whole year since some of the harvest is sold.

4.2.2 Mobilization of workforce

The Sukuma household in average has more people than the indigenous households. Table 5 shows the mean household size to be 8.42 persons per household, against 5.16 persons per household of peasants. The dependency ratio is 69.93% which is higher than 58.57% of the peasants. Polygamy is common among the Sukuma, which is deemed to be a way of adding new juvenile workforce into the household. This is in agreement with the observation by Charnley (1998) documenting that the Sukuma (in Usangu) tend to have larger number of people in the household for labour. Newly married couples are not allowed to establish their own household for a year or two. Instead they remain at the husband's homestead to contribute labour meanwhile being groomed for responsibilities of adulthood before they are released to start a new household. Observation of the household age structure shows that fertility is high among the Sukuma coupled with polygamy. They have active social capital whereby the association they have established enable them to perform collective cultivating (mainly hand hoe harrowing) called *kombakomba* system in which several households unite workforce and work in one household's field in rotation until all the households are done. This is helpful for them as it also helps to affirm their solidarity in other aspects outside agriculture (Charnley, 1998).

4.2.3 Livestock production

There are large flocks of livestock in the valley, however their actual number is difficult to establish. For example, the highest reported herd size is 65 cattle, but some households in the valley are believed to have even larger sizes. It is a common practice for livestock owners to under-report their herd sizes following recent accusations by the government that the livestock numbers have already exceeded the environmental carrying capacity. Apart from cattle, the agro-pastoralists keep other animals like goat, sheep, donkeys and chicken. They keep traditional breeds of cattle which have low milk yield.

Some households which produce enough milk especially during rainy season sell the milk to nearby indigenous settlements to get money which subsidise their living. Cattle are normally not easily sold or slaughtered for household consumption unless compelled with very special reason. The common reason for slaughtering or selling is to get money for buying food in drought years. Like most pastoral traditions, bride price is the largest single use of livestock flocks of the Sukuma in Kilombero Valley. The livestock production is by free range method. Range land is either bought or freely allotted to them by the village government. Because the allotted land is normally not enough for most of the pastoral households, transhumance is sometimes used to cope with land shortage and to allow for replenishment of the pastures. This supports observations of Msuya (2009), in his study which analysed land administration by pastoralists and farmers in Northern part of Tanzania.

4.2.4 Income source diversification

Cash income for the Sukuma households accrues from diversified sources (Table 6). Eighty seven percent of the Sukuma households reported to sell their food produce so as to get cash money. About 9.6% get their income from sale of livestock or livestock products e.g. milk, eggs and meat. About 3.2% of Sukuma households are forced to do agricultural labour using their oxen ploughs to work in the peasants' fields, or other agro-pastoralists who cultivate bigger areas so as to contribute to their income. Table 6 shows various main income sources for the livelihood groups. *Simsim* is now being introduced as a cash crop, replacing cotton. This crop is promising as it was selling at Tsh. 1000/= per kilo at harvesting in 2012.

Table 6: **Major income sources of livelihood groups**

Livelihood group	Sell food crops	Sell livestock	Sell agric. labour	Do petty-business	Do fishing	Other activities
Peasant (n=55)	33	0	4	5	4	9
	(60.0%)	(0.0%)	(7.2%)	(9.09%)	(7.2%)	(16.36%)
Agro-pastoralist	27	3	1	0	0	0
(n=31)	(87.1%)	(9.67%)	(3.2%)	(0.0%)	(0.0%)	(0.0%)
Other (n=18)	5	1	1	8	0	3
	(27.78%)	(5.56%)	(5.56%)	(44.44%)	(0.0%)	(16.67%)
Total (n=104)	65	4	6	13	4	12
	(62.5%)	(3.8%)	(5.77%)	(12.5%)	(3.85%)	(11.54%)

4.3 Livelihood Strategies of the Indigenous Non-Migrant People

People referred to as indigenous in this study are a mixture of the Ndamba, Pogoro, Mbunga, Ngindo, Bena, Ngoni, Ndwewe and other minority ethnic groups.

4.3.1 Crop cultivation

The indigenous are mostly peasants, cultivating mainly rice for food and sale. Some few grow maize in small fields since it is not a traditionally preferred food to them. Their total maize production is far less than that produced by the migrant Sukuma. Weeding of rice is the most onerous task in rice cultivation. Unfortunately, this work is traditionally left to women on top of the normal responsibilities shouldered by rural women. The average acreage per household is also small as shown in Table 5. This leads to low production of household yield. Cassava, sweet potatoes, banana and vegetables are also grown in small quantities. These are called famine foods, and are traditionally used as snacks, not as main meals.

4.3.2 Mobilization of work force

Workforce is a big challenge in indigenous households. The technology used is still mainly hand hoe. Older children, both boys and girls, do not like farm work. Most of them migrate to urban centres for domestic or unknown jobs, as they leave the villages

unskilled. Of all the sampled indigenous households, only two had some few cattle, representing 2.7%. Despite a long stay of agro-pastoralists in the valley, indigenous people have not yet adopted the livestock keeping tradition, though they acknowledge the usefulness of draught power for amplifying their farming activities. They have since then remained to be the market for the agro-pastoralists' oxen plough which is generally agreed to be the best alternative to the hand hoe technology used by majority of households.

In one of the discussions with the key informants, a representative from migrants' households admitted to have benefited from their hosts in terms of fertile land hire and market for their livestock products like milk and the barter trade of meat for rice or maize. Only few households use oxen plough and animal manure technologies to improve their ever diminishing harvests. Therefore the migrants benefit from the hosts. Thus there is little reciprocating synergy between livelihood groups in the valley despite the prevailing high potential.

4.3.3 Consumption pattern

Indigenous people are rice eaters. Even the Bena and Hehe of the valley prefer rice to maize meal, unlike those of Njombe and Iringa. Because maize is produced in small quantities, the price of maize flour becomes higher than that of rice in some remote parts. According to Village Executive Officer (VEO) of Ngoheranga village, the price of one kilo of rice in June, 2012 was Tsh. 1000/= while the price of same quantity of maize flour was Tsh.1100/=. The types of dishes and number of meals vary with seasons. During harvesting season, rice is consumed extravagantly in the morning, afternoon and evening. This exclusive rice consumption is worried to be detrimental to children's health, due to beriberi or to the tradition of early morning eating, of leftovers *(upolo)* without due heating. The indigenous people are the most vulnerable to food insecurity in terms of

dietary diversity and the number of months in a year during which their harvested produce lasts in store (Table 7). In the first eight months after harvesting most indigenous households will have exhausted their harvested food stocks. Also dishes of the indigenous people are monotonous, with low dietary diversity.

Table 7: **Response of some household characteristics to household food security**

Livelihood	Workforce	Household size	Average months of sufficient food	DDS
Agro-pastoral	2.42	8.42	9.9	6.8
Indigenous peasant	1.96	5.16	8.2	5.2
Other	1.89	5.33	10.33	5.8

Consumption of the new produce starts early before rice is fully ripe in the field. *Pepeta* is a valued traditional snack made from paddy just as it starts ripening. *Mchopeke* which is a traditional name for parboiled rice is a traditional processing method in which unripe paddy grains are cooked by steam, and then dried in strong sunshine. This process makes the grains hard enough to be hulled into rice kernels ready for cooking. Some people have the opinion that this is misuse of the food, but the fact of the matter is that, this is a coping strategy adopted by some households so as to reduce food insecurity soon before the main harvesting time.

4.3.4 Income source diversification

After the failure of cotton, there is no other cash crop in the valley. Instead, rice and maize are both cash and food crops. The main income source of indigenous households is selling rice or maize of which the yields are low. The price of paddy by June 2012 was high compared to same month a year before. One tin of 18kg of paddy was sold at Tsh 10 000/= at Malinyi which is 150km away from Ifakara township, while the price of the same quantity a year before was Tsh 6000/=. At Minepa, 20km away from Ifakara the

price of the same quantity of paddy in June was Tsh 9000/=. This attractive price of food is likely to lure peasants with little harvest, sell most of their produce and later fall prey of hunger. Simsim is promising cash crop but it is not yet well adopted by the indigenous people. The rice milling enterprise in Ifakara and other villages along the road to Mikumi, shows why the valley's food base exhausts early before the next harvesting season. This leaves most of poor households acutely without food for a number of months as shown in Table 7. This observation agrees with Chamwali (2000) and Kato (2007), who held that the reason for transitory food insecurity in the valley is overselling of food to meet pressing cash needs. However this study observes that some peasants are lured by the high prices, anticipating to use the money for buying less expensive foodstuffs like maize whose price eventually soars high before they have made up their mind, and therefore not realizing the advantage.

Another activity is fishing or fish selling. Fishing is for skilled men who own fishing equipment or who hire them from owners. Fishing used to be a reliable livelihood activity, but increase in demand for fish in townships like Ifakara, Mahenge and even outside the valley has caused illegal and excessive fishing which overwhelmed the fisheries. Following this malpractice, the government banned fishing activities in Kilombero river for six months starting from 1st December, 2011, to allow for replenishment of the same. This made majority of households to go without fish in their diets which used to be a life long tradition of households in the valley. Worse more, the households whose main livelihood activity was fishing became highly vulnerable following this *institutional* closure. The river was re-opened for licensed and controlled fishing on the 12th June, 2012, but as would be expected fishermen couldn't resume their activities due to lack of fishing gears caused by the impoverishment they have undergone during the ban.

4.3.5 Micro finance groups

There are several community microfinance credit groups in the names of *vikoba, vibubu* and *vikebe*, whose membership is voluntary and open to every body, with little entrance token fee. The aim of these schemes is to enable members to save and borrow money. Before introducing these schemes, poor people were borrowing money from livestock herders and petty businessmen with very exploitative terms of paying back. According to the schemes' village resource person of Minepa village, the scheme has been a great remedy to people, since they have a place to save their treasures and borrow at times of need. Another advantage of introducing these groups is that it has decreased the demand to work for agricultural wage labour. As the result, farmers who employ wage labourers had to increase the wages for the same piece of work. Also the terms of transfer whereby a borrower had to pay more than what he borrowed, have now ceased.

4.3.6 Copping strategies

In extreme cases both copping and survival strategies are employed. The School Second Master of Minepa Secondary School (ward school) complained in an interview that students performance drops tremendously during the end of year than the mid-year examinations. He said this is because students are left alone in the village while their parents migrate temporarily to distant paddy farms, leaving behind the school children with only one meal a day which may be only porridge. Truancy and low concentration in classes due to inadequate food are the main cause of low school performance. The reason for truancy is that some parents hold back school children, so that they can contribute agricultural wage labour, necessary to get money for buying food.

According to Minepa Ward Education Coordinator, disciplinary actions are common in schools during farming season. Primary and secondary school girls are caught having

affairs with petty businessmen, as means of warding off food problems. The teacher specified a case in which a student testified that she had accepted a man because she was like abandoned by her parents, who were away for a week without bringing her some supplies. He concluded "in this case, school pregnancies in such seasons are not uncommon".

4.4 Household Food Security in the Valley

4.4.1 Number of months with sufficient food in the household and dietary diversity

Food security was partly measured using two variables *household dietary diversity score* (HDDS), and *the number of months the household still had some own produced food in store* (MONTFAVL). The results for the two variables show that the *mean food-secure months* for peasant households is 8.21 whereas for agro-pastoral households is 9.92, of the 12 months (Table 8). Overall, the proportion of households with food secure months above the median of nine months is only 45.2%. Comparison of these means, using independent *t-test,* shows the difference in food security in terms of number of months of food security between the two livelihood groups to be statistically significant (*p=0.01*). This means, on average the agro-pastoral livelihood provides 82.67% annual security to food, compared with pure peasantry livelihood which provides only 68.42%.

For the household dietary diversity variable, the results show that, the mean HDDS for agro-pastoralists household is 6.839 in the scale of 12 food groups (scores), whereas for peasant household is 5.2 (Table 8). Overall, the proportion of households with HDDS above the median of six is only 26%. The means difference for the two livelihood groups is statistically significant (*p=0.001*).

Table 8: Number of months of food availability and Household dietary diversity score (HDDS) means comparison, independent *t- test*

	Number of months of food availability (MONTFAVL)		Household dietary diversity score (HDDS)	
	n	**Mean**	**n**	**Mean**
Peasant	55	8.209	55	5.2
Agro-pastoralist	31	9.919	31	6.839
p		0.01		0.001

4.4.2 Nutritional status of children in Kilombero Valley

The indicators used for nutrition status of children are height-for-age z-score (HAZ) which reflects chronic malnutrition (i.e. stunting); weight-for-age z-score (WAZ) which reflects both chronic and acute under-nutrition (i.e. under-weight); and weight-for-height z-score (WHZ) which reflects short term food insecurity effects such as seasonal changes in food supply or short term nutritional stress brought about by shock e.g. illness (wasting). Mid upper arm circumference (MUAC) reflects under-weight or malnutrition in general.

Results in Table 9 show that on average about 15.3% of surveyed children were underweight (low weight-for-age), 47.2% were stunted (low height-for-age), 5.5% wasted (low-weight-for height) and 2.7% of children in the study area were obese.

The severe acute malnutrition (SAM) (*MUAC<11.5cm*) is 1.38% whereas the global acute malnutrition (GAM) (i.e. *MUAC<12.5cm*) is 5.55%. The measurements of indicators of nutritional status of children were calculated using the NCHS − 2007 integrated growth reference incorporated in the Nutri-Survey software.

According to the Tanzania Demographic and Health Survey of 2010, 45% of children under 5 years in the country living in rural areas have low height-for-age (stunted), 5% have low weight-for-height (wasted), and 17% have low weight-for-age (underweight)

(NBS, 2010). The survey results show that the agro-pastoral community has high proportion of chronically malnourished children (both stunted and under-weight) than the peasants (Table 9). However, the peasant children are more wasted (suffer immediate hunger) than the agro-pastoral children. Comparison of survey results with the data of rural population at Morogoro Regional and National levels, shows that the stunting and underweight rates among peasant children in the valley are lower than the National and Morogoro Regional averages. However the wasting rate among the peasant children is higher than the Morogoro Region and National rural areas averages. On the other hand, the agro-pastoral children have higher stunting rate but similar rates of wasting and underweight with the Morogoro Region and National averages as shown in Table 9.

 An interesting observation here is that; while agro-pastoral households have more number of months of food availability and higher dietary diversity score than peasant households, the nutritional status of their children is worse than that of the peasants. This can be explained by the famous entitlement theory as documented by Sen (1981). According to Sen, food availability does not ensure food security. In this case, members in some agro-pastoral households (especially children and probably women) are not equitably entitled to the food even though it is available, leading to this situation.

Table 9: Comparison between children's nutritional status of the Valley and those
at Regional and National levels

Condition		Survey results (%)			Morogoro Region (%)*	National results (%)*	
		Peasants	*Agro-pastoral*	*Overall*		*Overall*	*Rural areas*
Stunted (HAZ ≤ -2SD)		42.42	51	47.22	44.4	42	45
Wasted (WHZ≤-2SD)		6.06	5.12	5.55	5.3	5	5
Under-weight (WAZ ≤ -2SD)		12.12	17.948	15.277	16	16	17
MUAC	GAM (MUAC< 12.5)	3.03	7.69	5.55	-	-	-
	SAM (MUAC<11.5)	0	2.56	1.38	-	-	-

*Source: THDS (2010)

The survey results of GAM and SAM indicate a considerable deviation from the national status. This can be explained by the fact that the survey was done in February, which is a period of acute food shortage in the study area. The two malnutrition conditions could not be compared with that of the regional and national level due to unavailability of data. According to WFP (2009), the prevalence of GAM of between 5% and 9% indicates poor condition while GAM of less than 5% is acceptable. Therefore, nutrition situation among the agro-pastoral communities in Kilombero Valley, in this respect, is poor and not acceptable (Table 9).

Stunting is also higher among the agro-pastoral communities than the national average. However, such large indication of malnutrition is not uncommon in rural settings. Studies in Lindi Rural and Ruangwa Districts showed high levels of chronic malnutrition (stunting) rates of 45.9% and 46.5%, respectively. Also data from the Tanzania Service Provision Assessment in 2006 for Lindi, the region as a whole showed a rate of 55% stunting (Save the Children, 2009).

The *t-test* comparison of mean values of those nutritional outcome indices (Table 10) in the two livelihood groups show that the mean Weight-for-Age z-score, mean Weight-for-Height z-score and mean MUAC between the two groups are not statistically significant at $p \geq 0.05$ while the mean Height-for-Age z-score for peasant children are significantly lower than that of agro-pastoral children($p<0.05$).

Table 10: Anthropometric measurements (independent *t-test* comparison) results

	N = 72	MEAN HAZ	MEAN WAZ	MEAN WHZ	MEAN MUAC	MEAN NO. OF MEALS
Peasant	33	-2.4609	-1.3164	0.3133	13.721	2.52
Agro-pastoral	39	-1.3441	-1.0251	-0.2903	14.359	2.64
p		0.000	0.226	0.079	0.082	0.320

4.5 Livelihood Assets Endowment

Variables used in this aspect, which were hypothesized to have direct impact on food security are education, farm acreage, size of work force and dependency ratio. The two communities were compared in terms of these variables using independent *t*-test.

The results (Table 11) show that the peasant community is relatively more educated with mean year of schooling of 4.9 against 3.55 of agro-pastoralists. The peasant community also has low dependency ratio of 58.57% against 69.93% of the agro-pastoral community. On the other hand, the agro-pastoralists have a bigger household workforce of 2.42 persons per household against 1.96 of the peasants. The mean cultivated area is higher for the agro-pastorals, 12.9 acres against 4.22 acres of the peasants. All the variables are statistically different at 5% significance level (*p<0.05*).

Table 11: **Comparison of livelihood asset endowment (independent *t-test*)**

	N	Mean household size	Mean year of schooling	Mean work force	Mean dependency ratio (%)	Mean cultivated area (acres)
Agro-pastoral	31	8.42	3.55	2.42	69.93	12.9
Peasants	55	5.16	4.95	1.96	58.57	4.22
P			0.038	0.001	0.003	0.000

4.6 Asset Endowment and the Mediating Environment

Conversion of the asset endowment into food security outcomes among other factors is also mediated by other forces external to the household. According to DFID's sustainable livelihood model, the forces are divided into two categories. These are the Vulnerability Context also known as exogenous factors and the Transforming Structures and Processes also known as endogenous factors because they are the products of the society itself in which the household operates (Morris *et al*., 2000).

While most of the livelihood assets are considered in terms of the household or its individual members, some important assets may be held in common with a broader user group. In this context, institutions e.g. laws or bylaws, regulations and policies are necessary. Also structures like the village government, ward development council, district council, community groups, credit bodies and the court must play a role in enforcing and regulating the institutions in place. The purpose is to observe equitable access and use of the common assets and to protect them from extinction.

However, the operation of these structures and processes happens to be biased in favour of some groups in the community. To understand this, it was necessary to explore the representation of the agro-pastoral community in village government and Ward Development Councils (WDC). No member was found to represent the agro-pastoral

community in WDCs of both wards. This is because settlements of agro-pastoralists are not recognised as registered villages whose leaders would have been members of the WDC. According to the Ward Executive Officer (WEO) of Ngoheranga ward, there is one village in his ward which has an agro-pastoral member in its village government council. This member is a chairman of one of the hamlets in the village which is predominantly agro-pastoral.

Through discussion with a key informant, it was argued that the village and district bylaws e.g. the village land use plans, discriminate against the agro-pastoral community because they are not involved in their formulation and legislation. This is a typical case of social exclusion. According to village land use plans, agro-pastoralists are allocated land in the far remote areas from the main villages. The disadvantage of this is that the agro-pastoral communities do not equitably benefit from the public asset endowments like schools, dispensaries, roads, extension services, the police and even government transfers like food aid when there is food shortage. However, some pastoral households have adopted *transhumance* to cope with this problem. Transhumance is a practice of seasonally moving herds of livestock to distant grazing places so as to allow the nearby pastures to replenish.

The national conservation policy is another cited example of institutional deprivation of individual rights. The district government forcibly evacuated people who were purported to encroach the Kilombero Ramsar site, which is a government conserved area. In this plea, clashes between armed militia from the district government and the resisting Sukuma *sungusungu*, resulted into killings of several (number not specified) sungusungu youngsters who were shot down. This unpopular killing happened in March 2012 at Maguba village in Malinyi division.

Further-more, the Kilombero and Ulanga Districts' governments banned the use of Kilombero river and its tributaries for half a year long, starting from 1st December 2011, following the observation that the fisheries were running out of fish due to excessive and unsustainable fishing practices. Although it was a necessary intervention, the affected peasant and fishing households complained this to be another typical institutional disturbance to their livelihoods.

4.7 Factors Influencing Household Dietary Diversity Score

The household dietary diversity score (HDDS) reflects, the economic ability of a household to access a variety of foods. Studies have shown that an increase in dietary diversity is associated with improved socio-economic status and household food security (Hoddinot and Yohannes, 2002; Hatloy *et al*., 2000).

The hypothesized predictor variables predicting the HDD were education of household head (quantified by number of years of schooling), source of income (dummy variable), dependency ratio, total cultivated area of household in acres, education of household spouse (number of years of schooling) and livelihood group (dummy variable) as shown in Table 12 (also Appendix A for detailed results). The following assumptions were made between the dependent variable (food security status) and the independent variables as described above. Income generating activity determines the income level which then determines the purchasing power of the household, such that as household income accrues outside farm work (off farm diversification), the ability of the household to access diversity of foodstuffs increases as well, leading to acquirement of variety of nutrients. Therefore, a positive relationship between source of income other than farming (e.g. fishing) and variety of consumption at the household was expected.

The level of education attained by household head and or spouse is expected to increase awareness among households in terms of consuming dishes with varied foods/balanced diets. Therefore, a positive relationship between the education level of household head and/or spouse and nutrient adequacy among household members is expected. Cultivating large pieces of land enables people to grow different types of crops hence multiple choices of foodstuffs. Therefore there is possibility of positive relationship between dietary diversity and total cultivated area of a household. Livelihood group was included to capture cultural aspects of production and consumption. A household would be more burdened if it has a large number of non-producing than producing members. A negative relationship is expected in this case between household dependency ratio and food security in terms of HDD, as shown in Table 12.

Of the six variables deemed to have influence on the dependent variable, five were found to have significant influence. These are fishing as income generating activity, dependency ratio, total cultivated area of household in acres, education level of household spouse and agro-pastoral livelihood ($p<0.05$) as shown in Table 12. Education of household head was not found to be significantly influencing dietary diversity. Using enter method, a significant empirical Ordinary Least Square Regression Model (OLSRM) emerged at 5% ($F_{7,89}=10.3$, $p<0.05$, R=63.8% and $R^2=40.8\%$) as follows:

HDD = 6.77 + 1.23(AGRPST) + 0.18(EDUCSPOU) + 0.07(AREACULT) −

0.03(DEPRATE) − 1.75(FISHING). ……………………………………(1)

As seen from Table 12, the independent variables explain 40.8% of the variations in the dependent variable ($R^2=0.408$). The F-value is highly significant ($p=0.000$) at 5%

probability level, indicating that the regression model is statistically significant in explaining variation in the dependent variable.

Table 12: Estimated coefficients of the factors affecting household dietary diversity
Dependent variable: **Household dietary diversity score (HDDS)**

Variable	Coefficient	Standard error	Significance (*p*)	Collinearity tolerance	Mean
CONSTANT	6.771	0.682	0.000		
AGRPST	1.229	0.430	0.005	0.531	0.32
EDUCSPOU	0.182	0.050	0.000	0.669	3.29
AREACULT	0.070	0.035	0.047	0.544	7.691
DEPRATE	-0.033	0.009	0.001	0.916	61.92
FISHING	-1.754	0.763	0.024	0.929	NA
EDUCHH	-0.074	0.056	0.191	0.701	4.52
R	0.638				
R^2	0.408				
ADJUSTED R^2	0.368				
F-VALUE	$(F_{7,89}) = 10.322$	1.44	0.000		

AGRPST   Agro-pastoral livelihood as a dummy variable of livelihood (coded: 1 = agro-pastoral, 0 = not agro-pastoral)

EDUCSPOU   Level of education of household spouse (quantified by number of years of schooling)

AREACULT   Household's total area cultivated in acres

DEPRATE   Household dependence rate(percentage ratio of number of dependants to total household members)

FISHING   Fishing activity as a dummy variable of source of income (coded: 1 = fishing, 0 = not fishing)

EDUCHH   Level of education of household head (quantified by number of years of schooling)

4.8 Factors Influencing Household Food Availability and Stability

The operational definition for this item was the number of months the household had some own produced food still available in store labelled as MONTFAVL. In this case, the predictor variables predicting the MONTFAVL were: total cultivated area in acres, education of household spouse (number of years of schooling), source of income (dummy

variable), age of household head, dependency ratio, size of workforce and livelihood group (dummy variable). The hypothesized relationship between food availability and stability (the dependent variable) and the independent variables is as follows: Income source determines the income level which then determines the purchasing power of the household, such that as household income accrues outside farm work (off farm diversification), the ability of the household to produce foodstuffs increases as well. This may include ability to hire agricultural labour for purchasing food crops. Therefore, a positive relationship between income source other than agricultural labour and food availability and stability was expected.

The level of education attained by household head and or spouse is expected to increase awareness among households in terms of economy in consuming the harvested food so as it lasts for as long as the next harvesting season. Therefore, a positive relationship between the education of household spouse and food availability and stability at home was expected as shown in Table 13. Cultivating large pieces of land enables people to grow different types of crops hence get large volumes of harvest which is likely to stay long in store before it is exhausted. Therefore there is possibility of positive relationship between food availability and stability and total cultivated area of a household. Livelihood group was included to capture cultural aspects of production and food use/consumption. A household would be more burdened if it has a large number of non-producing (dependents) than producing members. A negative relationship was expected in this case between household dependence ratio and food availability and stability whereas a positive relationship was expected with the number of workforce in the household.

A negative relationship is expected in peasant livelihood for food availability and stability because peasants are compelled to sell the harvested food so as to get money to meet other

necessary expenses, and therefore food will not stay long in store. Lastly, it is expected that households with older household heads have more social capital (and therefore food sources) than younger headed households. Therefore it was expected a direct relationship between age and food availability and stability in the household.

Of the seven variables deemed to have influence on the dependent variable (food availability and stability), four were found to have significant influence (Table 13). Also see Appendix A for detailed results. These are total cultivated area of the household in acres, education of household spouse, age of household head and peasant livelihood ($p<0.05$). Dependence ratio, work-force and agricultural wage labour were not found to be significantly influencing food availability and stability (MONTFAVL). The OLSRM was far very significant at 5% ($F_{7,89}=7.08$, $p=0.000$, R=59.8% and $R^2=35.8\%$), as follows:

MONTFAVL = 12.3 + 0.1(AREACULT) + 0.15(EDUCSPOU) − 0.04(AGEHH) − 1.36(PEASANT)……………………………………………………………………(2)

The empirical results are summarised in Table 13.

Table 13: Estimated coefficients of factors affecting food availability and stability
Dependent variable: **Number of months of food availability in the household (MONTFAVL)**

Variable	Coefficient	Standard error	Significance	Collinearity tolerance	Mean
CONSTANT	12.306	1.301	0.000		
EDUCSPOU	0.147	0.060	0.016	0.870	3.29
AREACULT	0.100	0.046	0.032	0.582	7.691
AGRLABOU	-0.573	0.609	0.350	0.868	NA
WFORCE	-0.468	0.380	0.222	0.821	2.12
AGEHH	-0.038	0.017	0.025	0.751	46.68
DEPRATE	-0.014	0.014	0.316	0.780	61.92
PEASNT	-1.359	0.512	0.009	0.608	NA
R	0.598				
R^2	0.358				
ADJUSTED R^2	0.307				
F-VALUE	$(F_{7,89}) = 7.075$	1.9648	0.000		

AREACULT	Household's total area cultivated in acres
EDUCSPOU	Level of education of household spouse (quantified by number of years of schooling)
AGRLABOU	Agricultural labour as a dummy variable of source of income (coded: 1 = agricultural labour, 0 = not agricultural labour)
WFORCE	Work force (number of working persons in the household)
AGEHH	Chronological age of household head in years
DEPRATE	Household dependence rate (percentage ratio of number of dependants to total household members)
PEASNT	Peasantry as a dummy variable of livelihood (coded: 1 = peasant, 2 = not peasant)

As seen from the results in Table 13, the included variables explain 35.8% of the variations in the dependent variable (R^2=0.358). The F-value is highly significant at 5% probability level (*p=0.000*), indicating that the independent variables all together are statistically significant in explaining variation in the dependent variable.

Another interesting observation in this finding is that it is the education of spouse (women) and not household head (men) that has shown to positively influence the food availability and stability in the household. This is likely because women in rural areas are mostly responsible for taking care of the family and therefore make sure that the available/harvested food is used prudently to cover as many months as possible before the next harvesting season. This is in agreement with the general consensus that if you educate a woman, unlike a man, you make for the education for the entire family. According to the regression equation, it is implied that: for every unit increase in the number of years of schooling of a spouse, the number of months of food availability in store increases by 0.15 months. The relationship between age of household head and MONTFAVL has been opposite to what was expected. Increase in the age of the household by one year has resulted in the decrease in the number of months of food availability by 0.04 months. This can be explained by the fact that as the household heads get older, they tend to accumulate more dependants in the household and therefore more mouths to feed and vice versa.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

i. The migration of pastoralists and agro-pastoralists into Kilombero Valley has caused several challenges to socio-economy and environment in the area. Despite low productivity, more land is now used for crop production due to availability of animal draught power. Apart from livestock keeping, the Sukuma people are also the leading growers of crops in the valley. They grow rice, maize, sweet potatoes, cassava and to a small extent, simsim. The price of food products is ever increasing creating problems to the poor households who can't afford buying the food during shortage periods. This has adverse effects to the community especially children who have shown to face a considerable degree of malnutrition, manifested in terms of anthropometry of under-five children of both peasant and agro-pastoralists. The peasant children appear to be relatively better. Food security in terms of availability, stability and dietary diversity is better among the agro-pastoral households than the peasant households. However anthropometry assessments show the peasants to be nutritionally better than the agro-pastoralists implying that food availability does not necessarily ensure food security. The problem lies in utilization due to inequitable intra-household entitlement to the food as explained in the entitlement theory developed by Sen (1981). Overall the immigrants grow more food but their households are in average less food secure than the peasants.

ii. Livelihood asset endowment between the two communities is such that the agro-pastoralists are well endowed with livestock as productive assets and a reliable social ties that guarantees mutual help at times of need. Low education among

household heads and lack of social services is a burden to agro-pastoral community. Women in the migrant households have very low formal education, which has proven in this study to be a significant factor for food and nutrition security at household level.

5.2 Recommendations

i. Despite ownership of large flocks of livestock, and its contribution to the economy of the people in the valley, the agro-pastoralists should be educated to abide to principles of sustainable natural resource exploitation and environmental conservation for the benefits of the future generations. Some detrimental cultural practices like polygamy, early marriage, obsolete animal husbandry that involve cutting trees and burning bushes for new pastures, and illiteracy must be abolished as they have no more incentive in today's lifestyles.

ii. On the other hand, poverty, hunger, extravagant feeding practices, dependence on natural resources and laziness which are inherent in the culture of the indigenous peasants have no place in the modern competitive economy aspired in the Vision 2025. The indigenous peasants have opportunity to keep livestock for milk, food and draught power because they have enough land. The transformation from hand hoe to oxen plough tillage will turn around their agricultural production. Likewise keeping small livestock like poultry, sheep and goats is a good shield against livelihood shocks for poor households. Moreover, the indigenous people should abolish unnecessary traditions of eating exclusively rice during harvesting time; instead they must include various available foodstuffs in their dishes for better nutrition. They should stop complaining about the presence of cattle in the valley instead of adapting themselves into the livestock economy while observing the

environmental conservation rituals. This will increase their resilience to shocks and protect them against the current fragility. Various organisations in and outside the valley should establish programs to turn around people's attitude towards poverty and hunger. Special emphasis on female education must be an indispensable element in development programs in the future.

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APPENDICES

Appendix 1: Regression analysis results

(i) Dietary Diversity Score (DDS)

Descriptive Statistics

	Mean	Std. Deviation	N
dietary diversity score of households	5.866	1.8122	97
Agro-pastoral dummy variable	.32	.469	97
number of years of schooling of spouse	3.29	3.608	97
cultivated area of the household in acres	7.691	5.7570	97
percentage proportion of dependants	61.9201	16.79698	97
fishing for income	.04	.200	97
number of years of schooling of household head	4.52	3.113	97

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.638[a]	.408	.368	1.4405

a. Predictors: (Constant), number of years of schooling of household head, fishing for

income, percentage proportion of dependants, cultivated area of the household in acres,

number of years of schooling of spouse, agro-pastoral dummy variable

ANOVA[b]

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	128.509	6	21.418	10.322	.000[a]
Residual	186.748	90	2.075		
Total	315.258	96			

Coefficients

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	6.771	.682		9.934	.000		
agropastoral dummy variable	1.229	.430	.318	2.856	.005	.531	1.884
number of years of schooling of spouse	.182	.050	.362	3.652	.000	.669	1.496
cultivated area of the household in acres	.070	.035	.222	2.019	.047	.544	1.837
percentage proportion of dependants	-.033	.009	-.303	-3.576	.001	.916	1.092
fishing for income	-1.754	.763	-.194	-2.299	.024	.929	1.076
number of years of schooling of household head	-.074	.056	-.128	-1.318	.191	.701	1.426

a. Dependent Variable: dietary diversity score of household

(ii) Number of Months Food is Available in Store (MONTFAVL)

Descriptive Statistics

	Mean	Std. Deviation	N
number of months of food availability in store	9.134	2.3602	97
cultivated area of the household in acres	7.691	5.7570	97
number of years of schooling of spouse	3.29	3.608	97
sell agricultural labor for income	.14	.353	97
number of working persons in household	2.12	.582	97
age of household head	46.68	13.753	97
percentage proportion of dependants	61.9201	16.79698	97
peasant dummy variable	.53	.502	97

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.598[a]	.358	.307	1.9648

a. Predictors: (Constant), peasant dummy variable, age of household head, sell agricultural labor for income, number of working persons in household, number of years of schooling of spouse, percentage proportion of dependants, cultivated area of the household in acres

Anova

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	191.183	7	27.312	7.075	.000[a]
	Residual	343.575	89	3.860		
	Total	534.758	96			

a. Predictors: (Constant), peasant dummy variable, age of household head, sell agricultural

labor for income, number of working persons in household, number of years of schooling

of spouse, percentage proportion of dependants, cultivated area of the household in acres

b. Dependent Variable: number of months of food availability in store

Appendix 2*: * Questionnaires

SOKOINE UNIVERSITY OF AGRICULTURE
Development Studies Institute

1. QUESTIONNAIRE ON LIVELIHOOD STRATEGIES AND FOOD SECURITY AT HOUSEHOLD LEVEL.
Household number. ………….   Date of Interview ………….. Village ……........... Ward …………   Division…………............

	A: DEMOGRAPHIC INFORMATION				
A1	**Who is the head of household?** (sex)	1 = male 2 = female			
A2	**How old is the head of this household?**	*(years)*			
A3	**What is the marital status of the head of household?**	1 = married; 2 = widow; 3 = divorced/separated; 4 = single/never married.			
A4	**How many people in total are currently living in the household?**	*(number)*			
	How many children and adults are currently living in the household?	Me		Ke	
	0 – 5 years	A5		A6	
	6 – 17 years	A7		A8	
	18–65 years (work force)	A9		A10	
	65+ years (the elderly)	A11		A12	
	What is the education level of parents in this household? (how many schooling years)	husband		spouse	
		A13		A14	
A15	**Are you migrant or indigenous of this village/area?** 1 = indigenous; 2 = migrant.				
A16	**What is/was the reason for your immigrating?** 1 = follow my relatives; 2= seek agricultural alnd; 3= seek pastures; 4= other reason *(explain)*				
A17	**What is the type of house (construction materials)** 1= private house, durable material (brick, cement, tin roofed); 2 = wood and mud, tin roofed; 3 = non durable, thatch roofed; 3 = private non-durable material (wood, mud, grass); 4 = rented durable material				
A18	**What is the type of your toilet?** 1 = modern flush toilet; 2 = pit latrine (without water); 3 = open pit (no roof, no walls); 4= communal latrine; 5= no latrine/bush).				
A19	**Where do you get water for drinking?** 1 = Safe source (piped water, public tap, tube well/borehole, protected well, protected spring water) 2 = Unsafe source (river, unprotected well, unprotected spring water, canal)				
A20	**What is your main source of fuel for cooking?** 1 = firewood; 2 = animal dung; 3 = electricity; 4 = Gas; 5 = charcoal; 6 = other *(specify)*…………..				

B: AGRICULTURE AND LIVESTOCK							
i) Agriculture.							

	Do you grow these crops? 0=no; 1=yes		**What area have you cultivated last season** (acres)		**How much produce did you sell** (kg/no. of bags)		**How many months will the stock last before you start buying**	
Rice	B1		B2		B3		B4	
Maize	B5		B6		B7		B8	
Cassava	B9		B10		B11		B12	
Banana	B13		B14		B15		B16	
P otatoes	B17		B18		B19		B20	
Sorghum	B21		B22		B23		B24	

ii) Livestock.												
Do you keep these livestock now? 0=no; 1= yes.	**Cattle**		**Sheep / goat**		**Poultry**		**Dog**		**Pig**		**Donkey**	
How many do you have?	**B25**		**B26**		**B27**		**B28**		**B29**		**B30**	
Did you sell any animal last year.	**B31**		**B32**		**B33**		**B34**		**B35**		**B36**	
Why did you sell animals? 1= need of money; 2= old age or sickness; 3= lack of water and pasture; 4=other *(specify)…*	**B37**		**B38**		**B39**		**B40**		**B41**		**B42**	

C: HOUSEHOLD INCOME						
How many household members ern income			**Now**		**Last year**	
			C1		**C2**	
What is the most important source of income? What comes second?				Main source		2nd source
1 = sale of food crops; 2 = sale of livestock/livestock products; 3 = agricultural wage labour; 4 = petty business/brewing; 5= fishing; 6 = other sources (*specify*)				**C3**		**C4**
Are the two sources of income regular? 1= temporary/casual; 2= seasonal; 3= permanent				**C5**		**C6**
If daily casual agricultural labour, which family members do it? 1= father; 2= mother; 3= children ; 4= father and mother; 6= mother and children; 5= all household members					**C7**	
Where is the work sought?		1= local company; 2= rich farmers; 3= pastoralists; 4= permanent employees; 5= distant places (*migration*)			**C8**	
Which month of the year is the work available		1= July – Sept; 2= Oct - Dec; 3= Jan – March; 4= Apr – June; 5= any time			**C9**	
What is the erned income used for?		1=food; 2= medical; 3=development contributions; 4= school fees; 5= saving.			**C10**	
C11	**Has your household income changed in the past 1 year** 1= decreased; 2= increased; 3= not changed.					
C12	**How much has it changed?** (increased/decreased, *estimate percentage*)					
	When you are in need, can you receive food from friend, neighbour or relative?			O= no 1= yes	**C13**	
	Have you received such support in the past 12 months?				**C14**	
	Do you currently give support to relatives, friends or neighbours who are in need?				**C15**	
	Do you have household members who have migrated out?				**C16**	

When did they leave? 1= about 1 month a go; 2= about 6 months a go; 3= between 6-12 months a go; 4= more than 1 year a go.			Migrant 1	Migrant 2		Migrant 3	
			C17	C18		C19	
Why did they leave? 1= seek employment; 2=for studies; 3= for treatment; 4= join his/her new family; 5= insecurity/ threats *(e.g. in income, food, conflicts etc.)*			C20	C21		C22	
Do any of the migrants send money back?			0= no; 1= yes.	C23			
Do you currently own these?		0= no; 1= yes	Do you currently own these?		0= no 1= yes		
C25	Radio		C26	Agriculture tools (hoe, panga ect.)			
C27	Mobile phone		C28	Bicycle			
C29	Sewing machine		C30	Motorbike			
C31	Electric fan		C32	Oxen plough			
C35	Television		C36	Bank account			
D: HOUSEHOLD DIETARY DIVERSITY QUESTIONNAIRE (HDDQ)							
Now I would like to ask you about the types of foods that you or anyone else in your household ate yesterday during the day and at night							

	Food group	Examples/food name		0=no; 1=yes	
D1	Cereals	Maize, rice, wheat, sorghum etc.	1		
D2	White Root and tubers	White potatoes, yam, cassava etc.	2		
D3	Vit. A rich root and tubers	Pumpkin, carrot, orange sweet potatoes etc.	3		
D4	Dark green vegetables	Amaranthus, cassava leaves, spinach, kale, sweet potato leaves, cow pea leaves etc.			
D5	Other vegetables	Tomato, onion, egg plant, green paper etc.			

D6	Vit. A rich fruits	Ripe mango, papaya, guava, avocado.	4	
D7	Other fruits	Sour sop fruit, wild fruits		
D8	Offals/organ meat	Kidney, heart, liver(offals)	5	
D9	Meat	Beef, pork, lamb, goat, rabbit, game, poultry		
D10	Fish	Fresh or dried fish	6	
D11	Legumes	Dried beans, dried peas, lentils, nuts and seeds	7	
D12	Eggs	Poultry eggs	8	
D13	Milk and milk products	Fresh milk, cheese and yoghurt	9	
D14	Oils and fats	Oils, fats or butter added to food or used for cooking	10	
D15	Sweets	Sugar, honey, sugar cane	11	
D16	Spices, condiments and beverages.	Tea, coffee, togwa, coconut tree wine, bambuu tree wine/ulanzi	12	
	HDD Score			

Appendix 3: Key Informants Questionnaire

Date of interview .... Village …………; Name ………….; Occupation………………

A: DEMOGRAPHIC INFORMATION			
A1	**How many people are living in this village/ward/valley?**		
A2	**How many resident households are there in this village?**		
A3	**How many migrant households are there in the village?**		
A4	**How much workforce is there in the village?** (number of productive people)		
A5	**How many dependants are there?** (<18 years, > 65 years and the disabled)		
A6	**During the past 12 months have people left the village?**	0= no; 1= yes.	
A7	**Who leave most?**	1= men; 2= male youth; 3= female youth; 5= whole families	
A8	**Where do they go?**	1= nearby villages; 2= town; 3= outside the country	
A9	**During the past 12 months have people arrived to settle in the village?**	0= no; 1= yes	
A10	**Who have arrived most?**	1= men; 2= women; 3= female youth; 4= male youth; 5= whole families.	

B: HOUSEHOLD SOURCES OF INCOME			
What are main sources of food and income in this household? 1= sale of food crops; 2= sale of livestock and livestock products; 3= agricultural wage labour; 4= fishing; 5= natural resouse exploitation; 6= self employment; 7= petty business; 8 = other sources (specify…)	**Now**		**Five months a go**
	1st income source		
	B1		B2
	2nd income source		
	B3		B4
	3rd income source		
	B5		B6
What is the wage levels for unskilled casual labour	**Now**		**9 months a go**
Agricultural casual labour (e.g. weeding/ploughing/etc.)	B7		B8
Non agricultural casual labour (e.g. construction)	B9		B10
How do households obtain most of their food? 1= own production; 2= purchase; 3= work for food; 4= borrowing food/debt; 4= work for food; 5= other (specify)…………….	B11		B12

Where do most people go to purchase food? 1= local market within the village; 2= local market in neighbouring village; 3= local shop within the village; 4= distant places		B13		B14	
What is the trend for food prices at the local (nearest) market?		Currently compared with 9 months a go			
Rice		B15			
Maize	1= doubled or more compared to 9months a go 2= increased but less than doubled 3= almost no change 4= decreased compared to 9 months a go	B16			
Cassava		B17			
Sweet potatoes		B18			
Meat		B19			
Beans		B20			
Milk		B21			
What is the trend for livestock (live animals) **prices at the local** (nearest) **market?**					
Cattle	1= doubled or more compared to 9 months a go 2= increased but less than doubled 3= almost no change 4= decreased compared to 9 months a go	B22			
Sheep		B23			
Goats		B24			
Poultry		B25			

C: HEALTH AND EDUCATION				
Where do most people go for health treatment?	Now		9 months a go	
1 = Health centre within the village; 2 = Health centre in neighbouring village; 3 = Health centre/hospital in nearest district; 4 = Traditional healer; 5= other (specify)…………….	C1		C2	
How long does it take to walk to the nearest health centre/dispensary	C3		C4	
What are the main diseases affecting the population?	C5		C6	
1 = Malaria; 2= Acute respiratory infections; 3 = Diarrhoea; 4 = Skin problems; 5 = Other (*specify*) ……….				
What are currently the main constraints for households to receive health treatment?	0= no; 1= yes			
1= Long distance to health centre	C7		C8	
2= Lack of money to pay for drugs and/or treatment	C9		C10	
3= Lack of health insurance schemes	C11		C12	
4= Lack of drugs within the health centre	C13		C14	
5= Lack of health staff	C15		C16	
6= Corruption in health centres	C17		C18	
Where do most children go to school?	Now		9 months a go	
1 = Primary school in the village 2 = Primary school in neighbouring village 3 = No schooling	C19		C20	
How long does it take to walk to the nearest primary school?	C21		C22	
Currently what are the main constraints for households sending their girls and their boys to primary school	0= no; 1= yes			
	Boys		Girls	
Long distance to school	C23		C24	
Lack of money for clothing, uniform, textbooks etc.	C25		C26	
Lack of teachers	C27		C28	
Poor school facilities	C29		C30	
Cultural constraints	C31		C32	

Appendix 4: Anthropometry Form

VILLAGE.. WARD.. DIVISION...

| ANTHROPOMETRIC MEASUREMENTS |

CHILD ID NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Sex (1= M; 2= F)																				
Date of birth																				
Livelihood group of child's parents																				
Was this child sick in the last 2 weeks? 0= no; 1= yes.																				
What was she suffering from? 1= fever; 2= ARI; 3= Diarrhoea; 5= other disease																				
Was the child sent to hospital? 0= no; 1= yes																				
If not; why? 1= was not very sick; 2= there is no money; 3= hospital is very far/no transport; 4= given traditional medicine.																				
How many meals the child ate yesterday?																				
Weight of child (kg)																				
Height/length of child (cm)																				
MUAC (cm)																				
WAZ																				
HAZ																				
WHZ																				
Age in months																				