

**THE ROLE OF GROUP MANAGED GRAIN BANKS IN RURAL FOOD
SECURITY: THE CASE OF KONGWA AND CHAMWINO DISTRICTS**

BY

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**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
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ABSTRACT

The purpose of this study was to assess the role of Group Managed Grain Banks in ensuring rural food security. Specifically the study aimed to: describe the grain banks in terms of their functions and constraints, evaluate the contribution of grain banks on food supply consistency and security at household level and analyse operation performance of each grain bank. The study was carried in Dodoma region, using case study design at Kongwa and Chamwino districts. Purposive sampling was employed to select two villages in each district. A combination of qualitative and quantitative methods was used to collect data. Data were obtained from a sample of 100 respondents and processed by using Statistical Package for Social Sciences. Various analytical methods were employed. Descriptive analysis was used to describe socio-economic characters of respondents. T-test was employed to compare means of food security level between grain bank members and non members. Chi-square analysis of food security level across villages. Linear regression was used in establishing the relationship between indicators of food security level and predictor factors. Profit margin analysis was calculated for each grain bank to compare performances. The findings show that the main functions of grain banks are storage, food savings and food loan. Main constraints include poor management, inadequate capital and low compliance. Chi-square analysis shows that there is significant difference across villages. T-test result reveals that grain bank member households are more food secure than non member households, and statistically significant at 0.1 level of significance. Linear regression results shows that number of bags stored, total area cultivated and food loan access had direct bearing on food security status of the household. Profit margin ranged from 4.5% to 13.6% which imply a positive cash flow. It's recommended that building capacity of grain bank in management skills be given high priority.

DECLARATION

I, JACKSON GOLLAN SHIJA, do hereby declare to the Senate of Sokoine University of Agriculture that this dissertation is my own original work and that it has neither been submitted nor is it being concurrently submitted for degree award in any other Institution.

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The above declaration confirmed

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This work is dedicated to my beloved parents Mr. and Mrs. Gollan Fumbuka who laid the foundation of my education.

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LIST OF ABBREVIATIONS AND ACRONYMY

CHAPTER ONE

BoT	Bank of Tanzania
CFS	Comprehensive food security
DANIDA	Danish International Development Agency
EA	Energy Adequacy
FA	Food Adequacy
FAO	Food and Agriculture Organization
GMGB	Group Managed Grain Bank
HSS	Household self sufficiency
IFPRI	International Food Policy Research Institute
ILRI	International Livestock Research Institute
LVIA	Lay Volunteer International Agency
LGCDG	Local Government Capital Development Grant
MAFS	Ministry of Agriculture and Food Security
MES	Maize Equivalent Scale
NGO	Non Government Organization
NSGPR	National Strategy for Growth and Poverty Reduction
TFNC	Tanzania Food and Nutrition Centre
UNDF	United Development Fund
URT	United Republic of Tanzania

INTRODUCTION

1.1 Background Information

Tanzania's agriculture policy stipulates that food security is one of the highest development goals, both at national as well as at household level (URT, 1992). However, attaining food security remains a paradox (Lele and Mellor, 1990). About four decades after attaining independence, food security problem still linger in many parts of the country even at high rate than was in 1961. That is why Tanzania is classified as a low income and food deficit country (FAO, 2001).

The government is fully aware of the problem, yet unable to deal with it effectively. Efforts carried out through implementation of various projects and programmes aimed at increasing food production have achieved very little in terms of food security (Mwangile, 2002). Consequently many households are food insecure and face the problem of obtaining

sustainable and adequate access to food which is one of the most visible manifestations of poverty (Wagao, 1991).

Attributed to this failure, among others are poor/low investments in agriculture, weak institutional arrangements and most important is lack of broad based food security programmes. In agriculture based country like Tanzania achieving food security depend mainly on agriculture sector development. Agriculture remains the principle means of livelihood and primary source of food in rural areas, chief employer and contributor of National income. In 2006 agriculture sector contributed 44.7 percent of GDP and employed more than 80 percent of the total population (URT, 2006). Despite these, in the same year the sector was allocated only 6 percent of total budget.

Furthermore agricultural activities are constrained by structural problems facing small farmers, limited access to information, to input and output markets, financial markets and high exposure to shocks; all these justify the consideration of alternative institutional arrangements (URT, 2005).

Lack of broad based food security programmes need to be addressed. Since sustainable food security is destined for the welfare of people, it is equally true that it can be brought to reality by people, therefore technologies, policies, and strategies must focus more upon people (Hulse, 1995). As such organizing rural population through small farmer groups is crucial in achieving food security. Small farmers' organizations like Group Managed Grain Banks (GMGBs) need to be promoted and supported by all stake holders to stimulate active participation of the community in broad based food security.

Food security is more easily discussed in general rather than in specific terms. In principle state of food security is one which the individual or communities under consideration

enjoy consistent access to food, that is in proper quality, quantity and composition and nutritional adequate. FAO (1983) formulated basic concept of food security implied that “all people at all times have both physical and economical access to the basic food they need”. The World Bank (1986) has modified this formulation to indicate that food security is “access by all people at all times to enough food for active, healthy life”.

Increasing food availability at national level is a necessary condition for achieving household level food security, but is not sufficient. Increasing agricultural production alone does not necessarily translate into more stable, sustainable, adequate food consumption at household level. It is the household’s ability to obtain food when it needs it that is equally important (Reddy, 2007).

Although Tanzania’s food policies of 1990s accommodate the need to focus on vulnerable households, its main weakness is the lack of specific strategies to deal with rural food security. Consideration of developing strategies which promote community based food security programmes is highly required. As such, the ongoing effort to implement grain banks in rural areas, are therefore a move in right direction to improve rural food security in general and household food security in particular. Ensuring sustainable rural food security means focusing on grain banks which have emerged as the best rural food security strategy. Tanzania’s development vision 2025 realize the need for promotion of broad based grass roots participation in mobilizing of resources, knowledge and experience with view to stimulate initiatives at all level of society as priority goal (URT, 2005). The NSGRP identifies a number of priority sectors, whereby investments are critical for achieving the goal, one among the others is to improve food availability (URT, 2005).

1.2 Group Managed Grain Banks

GMGB defined as community based food security group/association which provides saving and credit service, whereby most of the transactions are done by using grains with few transaction done in cash. Members' savings are organized by collecting grains and credit provided in grain (i.e. Food loan). This does not mean that there is absolute no cash lending, depending on circumstance the GMGB can provide cash loan. GMGBs were initiated in 1998 in Dodoma region as a response of the community to combat food insecurity (Mtwale, 2005).

Prior to establishment of GMGBs small farmers used to obtain credit (food or cash) from local lenders who lended at a prohibitively high interest which ranged from 300% to 500% (locally known – Songoleda in Kigogo) for a loan lasting for one year (Mtwale, 2005). Therefore GMGBs emerged as alternative means of securing loan; their primary mission is to improve the socio-economic conditions of members and the community around through an increased access to food.

1.3.1 Problem statement

Millennium Development Goals (MDGs) target number one is to halve, between 1990 and 2015 the proportion of people whose income is less than US \$1per capita per day and halve the proportion of people who suffer from hunger. If this is to be achieved effort must be directed in rural areas where both income poverty and hunger are more severe. Empirical evidences shows that many rural households experience both chronic and transitory food insecurity (FEWS NET, 2003). Estimates put the figure at around 42 percent of rural household regularly face food shortages (URT, 2001).

While this is true, it is clear that most indicators of food security at household level are linked to poverty (Reddy, 2007). In Tanzania, the incidence of poverty is most visible in rural areas than in urban. According to Kayunze (2001) 60 percent of rural populations were poor compared with 39 percent in urban areas in 1997. Poor families, particularly those living in the rural areas face crisis of food availability/ accessibility during some particular seasons, named as lean seasons. Seasonal fluctuations in food availability are often seen to be most prevalent in drought prone semi arid tracts, as these are resource deficit both in natural resources and capital resources.

Dodoma region on top of being semi arid is also among the regions which harbours majority of poor people in Tanzania (Msangi, 2007). Most of these people depend on agricultural activities for their livelihood and food. Due to semi arid condition of the region, rain fed agriculture is characterized by uncertainty, small profit margins and low productivity. Prices of food are volatile with low prices during low season (Harvesting period), and high during high season. This situation creates uncertainty and risks which subject the population under constant threat of hunger. That is why Dodoma region is considered as a traditional prone region with 45 percent of its population facing chronic food shortages each year, as the result protein malnutrition is a major problem (URT, 2003).

To solve this situation, grass roots initiatives are the fore needed to address the problem of rural food insecurity and farmers organizations like Group Managed Grain Banks [GMGBs] are in ideal situation to carry out food security initiatives. Since their efforts at the local level will contribute to solving food insecurity at national level. On other hand, to withstand the challenges posed by market liberalization and globalization, farmers are

seeking new ways of organizing themselves so that they became dependable, effective, and efficient in endeavour to improve their welfare (Madaha, 2007).

Based on these reasons, farmers in Dodoma region initiated GMGBs in 1998 as community intervention measures to solve rural food insecurity problem. Despite the fact that GMGBs were introduced since 1998 and their role in rural food security they have received little attention of researchers. At a time when rural development issues are taking centre stage the need for improving rural food security so as to lessen poverty is even more urgent. Hence clear understanding of GMGBs role in improving rural food security is needed. Their performances as well as constraining factors must be well known to make them effective, efficient and dependable organizations. This is necessary for smooth partnership with other stakeholders in rural food security. Given this information gap, this study was proposed to ascertain this vital information regarding the role of GMGBs in rural food security using Kongwa and Chamwino districts as case studies.

1.3.2 Justification

Food insecurity remains a global threat and human tragedy. Therefore, a study which sheds light on local initiatives to alleviate food insecurity in rural area is of importance. The study aims to determine if grain bank model has positive role and can be replicated in other areas prone to food insecurity. It also addresses the Millennium Development Goals (MDGs), National Development Vision 2025, IFPRI - 2020 Vision for Food and National Strategy for Growth and Reduction of Poverty (URT, 2007, 2005).

The information obtained can; first, help to strengthen the capacity of GMGBs to minimize individuals and households vulnerability and provide necessary support for those who are

in desperate condition. Second, it can assist development planners and policy makers to design an integrated food security plan which among others, enhances popular participation of smallholder farmers.

1.4 Objective of the Study

1.4.1 General objective

The general objective of the study is to assess the role of group managed grain banks in ensuring rural food security for smallholder households.

1.4.2 Specific objectives

Specifically the study aims to:

1. Describe the grain banks in terms of their functions and constraints.
2. Evaluate the contribution of grain bank on food supply consistency and security at house hold level.
3. Analyse operation performance of each grain bank.

1.5 Research Questions

1. What are the functions and constraints of group managed grain banks?
2. What is the contribution of group managed grain banks in food security at household level?
3. What are socio-economic factors which influence performance of grain banks?

1.6 Conceptual Framework

This is a hypothetical relationship between dependent variables and independent variables.

The effects of independent variables on dependent variable (Appendix 1) are explained as

follows: all independent variables are supposed to have a positive or negative correlation with dependent variable that is, food security as indicated by HSS, EA and FA. In this study it's assumed that the services provided by Grain Bank such as loan (food, inputs, cash) and grain storage influence the level of food security of a given family. Other family resources like area cultivated also have direct impact on level of food security of that family. Background variables affect food security indirectly.

CHAPTER TWO

LITERATURE REVIEW

The following discussion focuses on global, national and household level food security with much emphasis on the latter.

2.1 Concept of Food Security

Soon after the 1974 world food Conference, the attention shifted on vulnerable groups. Since it was observed that despite significant increase in food production and significant food reserves on global level, the incidences of hunger and malnutrition remained high. Therefore the conference noted that there was a need to focus more on means of food access by household and individuals which could be constrained by economic, social and cultural factors (Mbwambo, 2007).

Food security concept is particularly concerned with people's immediate risks of not having adequate access to needed food. Household food security is the capacity of the household to access stable and sustainable basket of food (Reddy, 2007). To make this real, it is important to put in place necessary policies and actions to make adequate food available as well as accessible at the household level across seasons and transitory shortages. The World Bank has made distinction between chronic and transitory food insecurities. Chronic food insecurity reflects continuous inadequate diet caused by the inability to acquire food. It affects households that persistently lack the ability to either buy or to produce their own. The transitory food insecurity is defined as a temporary decline in the household's access to enough food (World Bank, 1986; Reutlinger, 1987). It results from instability in food prices, food production and household income- and in its worst forms, it produces famine. It must be emphasized that food security remain a critical factor

in rural development, hence must be considered in totality by assessing all factors involved in both qualitative and quantitative terms

2.1.1 Household food security indicators

Given complexity of food security concept, different indicators have been developed for analysis. Maxwell and Frankenberger (1992) list 25 broadly defined indicators. Chung *et al.* (1997) cited by Mbwambo (2007) noted that even a simple indicator such as a dependency ratio can come with many different permutations which add up to 450 indicators. Measures of consumption, poverty and malnutrition are all used as proxy measure and indicator of assets and income that are used as more distal determining factor (Maxwell *et al.*, 1999).

All measures are related to food security, yet none of them capture the concept accurately or completely (Mbwambo, 2007). Especially none of them address the crucial issue of vulnerability. This highlights how complex food security is; to be adequately captured by a single indicator, to address this, the study employed multi indicators approach. Monitoring of food security can be done at national, regional, household and individual levels. At national and regional food security can be monitored in terms of indicators of production, supply, trade, stock and market prices (Leathers and Foster, 2005). However, the best approach to monitor food security is done at household level. It is important to determine who is, why and how they become vulnerable to food insecurity.

Food security indicators broadly are divided into two categories –process indicators and outcome indicators. The former reflect both supply and access by pointing to the risk of event and coping ability, while the latter serves as proxies for food consumption

2.1.1.1 Process indicators

Process indicators include, risk of event indicators and coping ability indicators. Risk of event indicators is critical dimension of household food security which reflects the ability of the household to obtain food that is available in the area. These are indicators that provide information on the likelihood of shock or disaster event that will affect household (Hulse, 1995). They include measures of agricultural inputs and production including agro-meteorological data, access to natural resources, institutional developments and markets infrastructures and exposure to regional conflicts or its consequences.

While coping ability indicators reflects food access and they include socio-economic variables that represent the degree of stress being experienced by the population as economic and social conditions change and how the household respond to those changes. They provide information on the population affected by a shock or a disaster to withstand the effects.

2.1.1.2 Outcome indicators

These indicators generally estimate for adequate food consumptions. They are grouped into direct and indirect outcome indicators. Direct outcome indicators reflect actual food consumption rather than to market channel information or medical status. These include household budget and consumption data, household perception of food security and food frequency assessment. These types of indicators are difficult to collect and are not readily available.

Indirect outcome indicators include storage estimates and Subsistence Potential Ratio (SPR). Frankenberger (1985) pointed that SPR compares the amount of food (calculated in

energy), which a household can produce over the year with the energy requirement of the entire household for that year. In Tanzania a more practical and simple form of SPR is the use of food security card that has been designed by Tanzania Food Nutrition Centre (TFNC). With this complexity the challenge for a researcher is to search for a reliable and cheap indicator(s) to be used in analysis of household food security.

2.2 Determinants of Food Security

These include factors associated with food production such as availability of land, access to credits, labour, education level and agricultural practices all affect food security situation. Similarly, factors related to stability of available food such as storage and processing, social sustainability and sustainable play crucial role in determining food security. Most important are conditions which determine food access such as physical, social and economic accessibility (Maxwell and Stephen, 2003). These to some extent are determined by macro and micro economic policies.

2.2.1 Dimension of food security

Achieving food security has three dimensions, which include availability, accessibility and adequacy of food. Availability requires that there be a stable sustainable system of production and distribution to provide food sufficient to satisfy the needs of all dependent people and resilient enough to survive the natural climatic and human disturbances by which crop and livestock production can adversely be affected (Maxwell and Stephen, 2003).

1. Accessibility must not be limited by what economist describe as “effective demand” population of all income and social categories, rural and urban, must have access to

nutritionally adequate supply of food. In a free market economy, all must have sufficient disposable income to afford the purchase of food sufficient for their needs.

2. Adequacy can be described in general terms as food supply that satisfies different nutritional needs among various conditions of man, women and infants, young and old, rich and poor, which make up national and communal population.

At household level, food security dimension depend on households current food supplies, past stable food supply and potential supply (Gittelsohn, (1998), cited by Mbwambo, (2007), the Potential future food supply is a function of the household available resources such as capital, land, labour and time.

2.3 Food Security Global Perspective

Although over the years governments, with support from FAO and other development agencies, have addressed food security and its related elements in many ways, to date some 800 million people in developing countries (About 20% of the total population) are chronically undernourished. With growing world population, the present figure of 5.7 billion is expected to rise to 8.3 billion by the year 2025. The situation will worsen unless very determined and well targeted actions are taken to improve food security. Sub-Saharan Africa and South Asia stand out as the two developing country regions where the prevalence of human malnutrition remains high: 34% in Africa and 23% in Southern Asia. In Sub-Saharan Africa, the total number of hungry people climbs each year (FAO, 2001).

2.4 Food Security at National Level

In Tanzania during the 1970s and 1980s the central goal was to achieve national food target and food self sufficiency. Food security planning was centrally run with fixed goals and many multisectoral initiatives with government hand in production and marketing. However, realizing the complexity of food security, and in order to accommodate socio economic changes, the 1990s food security policies focused more on food insecure groups themselves. The central message was the emphasis on household food security and not national food security.

At national level food security can be measured by looking at aggregate supply and aggregate demand balance. That is total food production per given period against total requirement under the period in question. Food security at the national level does not necessarily indicate food security among regions, communities, households and individuals (Reddy, 2007).

Tanzania's overall National food Self Sufficient Ratio (SSR) is satisfactory at National level, but the challenge is and remains to be the distribution modalities of food stuff from surplus areas to those with food shortages (URT, 2007). In 2005/2006, food crop production reached 10.9 million tones that the SSR was 112 percent and in 2007/2008 the SSR was 109 percent, signifying satisfactory level. Despite this satisfactory SSR at National level in that period, the proportion of districts reported to have food shortages has been on the increase from 15 percent in 2001/2002 to 50 percent in 2006/2007 (URT, 2007). The seriousness or magnitude of food insecurity across the country differs from one region to another depending on natural endowments especially reliability of rainfall, soil fertility and human capital. In most cases food insecurity is more serious in

central areas of Tanzania, as these have low rainfall and is unreliable. That is why Dodoma region often face food insecurity problem, which demand serious attention since it affects a substantial proportion of the population.

2.4.1 National efforts to achieve food security

The government efforts to provide food security at household level can be traced back since independence. Just after independence the government initiated several campaigns and programmes to mobilize the community action toward realizing household food security. The slogan ‘Uhuru ni Kazi’ which means ‘Independence and Work’ was used to steer the people into action. The period of 1967 – 1992 was led by the Arusha declaration, which articulated in the philosophy of socio- economic liberalization based on socialism and self reliance as long term National development goal (URT, 2004). Implementing Arusha Declaration was a strategy of focusing on achieving household self sufficiency and improves nutrition of family members (Ishengoma, 1998). The Iringa Declaration emphasized on agriculture modernization aimed at improving both productions and productivity. Food is life (1975) was aimed at mobilizing and orienting people to produce sufficient food.

Following economic liberalization in early 1990s, the government formulated agriculture policy of 1993 aimed at steering nation self sufficient and high nutritional standard for all Tanzanians (Ishengoma, 1998). To accommodate socio- economic changes, the National Food Strategy (NFS) of 1993 and Comprehensive Food Security Programmes (CFSP) were established, The CFSP summarizes major factors contributing to food insecurity problems in Tanzania as

- Insufficient Marketing system;

- Poor transport network ;
- Matching food demand and supply;
- Insufficient food crisis management;
- Lack of credit;
- Resource degradation and post harvest loses.

The formulation of food security and nutrition policy (1993) was a move in right direction. But the policy provided weak or no concrete strategies to deal with rural food security; as such it has attracted lots of criticisms especially of being urban bias. First, the policy focuses on meeting urban food demand while taking rural food security for granted, unless there is crisis such as drought, flood or pestilence. Second, the policy formulation failed to take into account the difference between urban and rural sectors in terms of income, infrastructure availability of social services (clean water, health, education) and culture. The current food policy relies heavily on the workings of the market while ignoring the weakly integrated markets in some rural areas (Geir, 1994, as cited by Nyange, 2002). The major question is whether the market is capable of adjusting fast enough to allow the food flow to the deficit areas in response to price changes before people starve (Nyange, 2002). Subject to the above shortcomings such as rural infrastructures, it is therefore clear that solving rural food security mainly depend on local or village based solutions like GMGBs.

Another step to oversee food security was the establishment of Strategic Grain Reserve (SGR) in early 1990s currently known as National Food Reserve (NFR). SGR was established by the Government as one of its food security instrument to ensure adequate supply during period of production shortfalls and to cover emergencies food shortage caused by natural disasters (Nyange, 2002). SGR is supposed to maintain food reserve to

stabilize food prices, with regard to NSGRP target, SGR is supposed to maintain grain reserve of at least 4 months of national food requirement (URT, 2007). In 2006/07 financial year, SGR purchased and stocked 27 500 tones of cereals, which is rather low compared to NSGRP's target. The big problem of SGR lies in its centralized systems. Because of the centralized nature, it has to bear costs on many over heads. The centralized procurement of food grains, movement over long distances, storage of food grains and buffer stocks has high administrative and handling costs (Reddy, 2007). Another shortcoming of SGR is urban bias, as it has continued to serve more the urban sector than rural sector (Ashimogo, 1995). Ashimogo pointed that, most of SGR stocks are strategically located in maize surplus areas and in major urban centres, with little operation in deficit rural areas. But it is these deficit rural areas who need most SGR's service because of severe food shortage them regularly faces. Regarding SGR failure, it is important therefore, that such centralized anti poverty programmes should give way to local initiatives and local participation based on principle of efficiency and equity.

Attempts to extend SGR services to remote rural areas have largely been unsuccessfully. This is mainly due to problems associated with extending centrally managed and governed system. The implication is that if the government is serious about tackling rural food security it has to make significant progress in helping village based food security system like Grain Banks, because GMGBs are cost effective ways, what is needed is an alternative approach to strengthen their governance and management of these community based associations and new approach to provision of financial services that build on the informal system already existing in those communities.

2.5 Food Security at Household Level

Food security at household level is defined as ability of family to secure enough food to ensure adequate diet intake throughout the year for its members (ILRT, 2003). It is a function of production resource, income availability for purchases which is sufficient to meet the aggregate demand for all household members. It therefore is concerned with intra household micro economics. That it describes the use of food in household and the influencing factors such as culture, beliefs, practices and food preparation. To be food secure the household must have means to produce (Land, production tools and inputs) and or purchase (Job and income) the food that the household need (Leathers and Foster, 2005).

Accessibility at individual level is determined by family size and composition, frequency of meals, cultural belief and taboos. Because of gender discrimination, female members of the family tend to receive lesser quantity of food compared to male members; again there are taboos which prohibit female from eating certain types of food (Ishengoma, 1998). In some communities meals are first served to men and women only eat their meals, after men have been satisfied. All these put women in a disadvantage position. Individual consumption can also be influenced by other factors like food preferences and eating habits (Mkunda, 2005). Therefore it's clear that, food security at one level doesn't necessarily imply food security at lower level.

2.6 Factors Contributing to Household Food Insecurity

2.6.1 Household size and composition

Traditionally, many tribes embrace a big family as a blessing. However, with the wind of socio-economic change this is no longer the case, because of hardship faced by larger families in feeding its members. Findings in the thirteen surveyed areas in Africa, Asia and

Latin America reported that food insecure households tended to be larger and have higher number of dependents and younger aged composition (FAO/WHO, 1992). These findings were similar to that in Sumbawanga- Tanzania. According to Ashimogo (1995), in Sumbawanga most of the families that ran short of maize before the next harvest were larger household as compared to small household, which had maize surplus. However, it's not easy to establish the optimum family size at which food insecurity starts. But given that all other factors are constant (Income and food production), larger families are more prone to food shortages than small families (Francois *et al.*, 1982).

2.6.2 Education level of household head

Ignorance and malnutrition are complimentary and any successful effort to reduce one is likely to diminish the other (Maxwell and Frankenberger, 1992). Low education among heads of households may lead to low nutritional status due to the effects on purchasing power, sanitation, person hygiene, feeding practices, food selection and budgeting (TFNC, 1988).

2.6.3 Household labour

The quality and level of labour determines the pace of national development in general. At household level, the quality and level of labour productivity, among others, determines the level of food security of that particular household. Labour productivity in turn is determined by food security, persistent food insecurity reduces the quality of labour.

2.7 Rural Food Security

Rural food security is very largely a question of rural self sufficiency (Lele and Candler, 1981). Empirical evidence clearly shows that there is close link between poverty and household food security. It is relevant therefore for various macro economic policies to

address poverty alleviation issues. Indeed poverty is considered as a warehouse of hunger. In Tanzania, the majority of poor live in rural areas and most of them are small farmers; therefore policies pursued in relation to agricultural development have a high significance in alleviating poverty and food security (URT, 2005).

Agriculture sector is at the heart of this effort due to multiple roles it plays as a source of employment, livelihood and one of the main motors of economic development. Agriculture sector remain the primary source of food, as such it's critical in achieving rural food security that is why a top priority is needed to the sector (URT, 2007). Given the close link between poverty and household food security, it means that strategies directed to reduce rural poverty do improve household food security. If rural poverty reduction strategy is to be achieved, two things must happen; first agriculture sector must grow at a sustained growth rate of at least 6 percent per annum. Second growth need to be broad based, and implemented (URT, 2005).

Economists argue that “the problem of the poor people is not food but purchasing power for food”. This is debatable in agriculture based economy country like Tanzania, because it's virtually impossible to increase the ability of poor people to purchase food unless agricultural production itself is increased. Increasing agricultural production through high productivity of both food crops and livestock is necessary condition in achieving food security due to improving food supply. Production increase by itself is only one part of the equation, to enhance food security it must be complimented by broad based physical food reserve and to a degree credit facility.

Regarding productivity in agriculture sector, on one hand and growth on the other, the general trend is disappointing. Growth rate performance has been fluctuating around low levels. In 2005 the sector growth rate was 5.1% but dropped in 2006 to 4.1%. The drop was attributed to the drought that plunged the country in 2005/06 season (URT, 2007). Likewise, productivity of food crops was not encouraging. Major cereal crops productivity has been fluctuating with general downward trend. Generally between 1994/95 to 2000/01 productivity of cereals was below 2000kg/ha, which is acceptable amount under rain fed condition.

While the government has constantly shown concern for agricultural development, its policies have largely been ineffectual and the allocation of government resources has demonstrated substantial bias against the sector (Lele and Mellor, 1990). For example in 2008/09 financial year, the sector was allocated 6 percent of the total budget (URT, 2008). This is far below the agreed target of 10 percent for SADC Countries. If the government is determined to meet MDGs and NSGRP targets in achieving food security, more efforts is needed in increasing agriculture production. MDGs projected to halve food insecure household by 2015 while NSGRP targets to attain 86 percent of household be food secure by 2010 (URT, 2000).

Since there is general agreement that, the major thrust of food security concern is to bring about a significant increase in production in a sustainable way and to achieve a substantial improvements in people's entitlement to adequate food and culturally appropriate food supplies (FAO, 2001), the role of the government is crucial in promoting, facilitating and supporting small farmers groups in realizing this. A study in East Africa (EA) recognized that food security schemes in most East Africa countries based on public distribution inadequately solved the problem of rural food security (Lele and Candler, 1981). Therefore

small farmers groups or associations are in better position to address food security issues due to socio-economic advantages compared to centralized food security like SGR.

Advantage of small farmers groups or association in achieving rural food security need not be over emphasized particularly in overcoming factors which constrain agriculture production in rural areas and being effective, cheap and more reliable. Factors limiting small farmers to access credit, market, inputs and extension services need to be adequately addressed. Lack of proper storage facilities and poor transport facilities put small farmers in disadvantage position. If these constraints are addressed well it will pave way for achieving rural food security. GMGBs aim at bridging this gap.

Within the framework of rural food security it has been realized that the key factor for success is small farmer's participation. The best way to achieve this is through organizing them into farmers groups. This help to promote and strengthen the collective self help capacity of small farmers. According to FAO (1995) small farmer groups have proved to be excellent vehicles for helping small farmers to acquire basic skills in problem solving and small scale enterprise management. Farmer groups offers unique opportunities for members such as access to information and extension services, credit services and market linkages. These mentioned factors if not addressed affect rural food security, small farmer groups like GMGBs are important rural development agencies in addressing them.

2.8 Factors that Affect Rural Food Security

2.8.1 Credit accessibility

One big problem facing small farmers is access to credit facilities. Credit is often a key element in modernization of agriculture. For not only can credit remove financial constraint, but also it may accelerate the adoption of new technologies. Credit facilities are

also an integral part of the process of commercialization of rural economy (World Bank, 1975). While this is acknowledged; persuading financial institutions to risks with small farmers until recently was a problem. However, last decade has witnessed the substantial effort that aimed at opening the small farmers' access to credit and sometimes to improve their incentives to meet the repayment obligations (Sherma and Zeller, 1997).

In Tanzania, the overall impact of financial sector liberalization has been the virtual collapse of financial services in rural areas. The new private banks have not replaced the cooperative system, since under liberalized system; profitability and risk militate against lending to agricultural sector (URT, 2003). The study by ESRF (2003) concluded that the main financial product needed in rural areas is credit. Currently the existing financial intermediary fails to cater for the need of the rural communities.

The fact remain, that the majority of small farmers can not afford to finance their agricultural production and marketing activities on cash basis particularly at the start of the season (ESRF, 2003). Prices of input have gone up (especially after removal of subsidies), such that to expect small farmers to finance farm operations from their saving is unrealistic (URT, 2003). Worse still, small farmers do not have adequate collateral cover to be able to secure loans from formal financial institutions (all of which are located in urban areas). In most cases depend on finding credit from informal sources. Lack of clear government strategy for provision of rural financial services, few donors funded project schemes and NGOs attempting to deliver credit to small farmers through group lending clearly signify that the existing set of financial institutions still have failed to meet the demand for credit in rural areas to finance agricultural production.

All over the world, credit institutions have always found advantageous and even necessary to deal with farming community through an organization preferably formed by the members of the community. More over, with the society as a convenient link with the farmers it become easier to integrate credit with supplies of inputs and extension for guidance to them which facilitate the transformation of tradition agriculture into modern one.

2.8.2 Market accessibility

Small farmer groups are meant to enable small farmers to combine forces in order to have more bargaining powers when dealing with inputs suppliers and buyers of their produce (URT, 2003). This is necessary in order to improve food security in rural areas. The primary motivation of this is to take advantages of economy of scale particularly in reducing overhead costs and good market linkages.

The main policy component during mid to late 1980s and early 1990s were to liberalize the marketing and pricing of food grains (URT, 2003). Despite this, with regard to food crops market, small farmers still face uncertain and in most case disadvantaged access to buyers of farm produce. Limited access to market compels small farmers to sell their surplus produce at the farm gate; as such farmers continue to be price takers. Poor roads and lack of reliable transport limit market accessibility, forcing small farmers to rely on the few traders who visit them.

Field research carried out in Kilosa and Morogoro Rural Districts revealed that the nearest market centre was between 3 and 6 km away from the village centre (Ellis and Mdoe, 2002). The majority of these markets are very small and attracting very few traders. Large

markets where prices are significantly better were often 10 km or further away. As the result, most farmers claimed to sell their crops at the farm gate. To overcome this obstacle, efforts should be directed toward organizing small farmers in producers association to take advantage of economies of scales.

2.8.3 Empowerment

The mindset changing and self reliance of rural people need empowerment. Empowerment is a process that increases small farmers and farmer groups to make choices and to influence collective decision towards desired action and outcome on the basis of those choices (DANIDA, 2004, World Bank, 2003).

2.8.4 Access to inputs

Input access is crucial in improving agriculture. However, following recent changes in policies, for example, the government withdraws from inputs provision; calls for small farmer groups to be active, and take important role in ensuring members have access to inputs (Madaha, 2007). The level of inputs use generally is not encouraging. In liberalized economic environment, assuming that farmers are rational in their choices the major question posed is whether input use has declined because relative price changes have made its use unprofitable? Or whether the collapses of cooperative as suppliers of input on credits have left vacuum? In some cases it is true that increase in price of inputs set against output shows that the overall terms of trade have turned against agriculture in general and especially true for food crops (URT, 2003).

With regard to institutional arrangements for providing inputs and credit after collapse of cooperatives, there are (if any) few alternative credit mechanisms, which simply prevents

farmers from buying inputs even if they could be profitably used (URT, 2003). An important consideration in input supply is the fact that the country is physically large while the transport network remains poor, to address these constraining factors and to accommodate recent changes like economic liberalization, farmer groups/ associations are in a better position to fill the vacuum left by cooperatives.

2.8.5 Extension services

The general purpose of agricultural extension service delivery is to improve the productivity of agricultural activities, to raise income of farm families and improve the quality of life of rural farm households. Farmer groups facilitate extension services and access to vital information. Evaluation of extension services in rural areas reveals that extension services were better in areas with farmer groups (Mushi, 2002, cited by Madaha, 2007).

2.8.6 Grain storage and management

The basic objective of storage is to create the appropriate environment conditions which provide sufficient protection to the product, to maintain its quality and quantity thus reducing product and financial losses. Storage helps to maintain domestic food security and maintain quality of food crops.

Achieving food security besides producing enough food grain proper and adequate storage and maintenance of the produced grain is equally important (Reddy, 2007). Issues of grain storage acquire added importance in the background of mounting population pressure on one hand and environmental constraints to increased intensive agriculture on the other. It is

very important to find ways and means of reducing the present heavy losses of food grains at the post harvest stage due to poor processing techniques and storage facilities.

In developing countries processing and storage are often overlooked. Compared to the developed countries losses at the time of harvesting are low as harvesting is done mostly by hand picking. In the developed countries harvesting is mechanised and leads to some losses at the harvesting stage (Reddy, 2007). But in the case of storage and processing developing countries face substantial losses as they still follow rudimentary methods. This also points to urgent necessity of improving storage and processing methods in countries like Tanzania.. Another fact that farmers in Tanzania tend to retain a substantial proportion of their food crop output with them, either for self consumption, or for seed purposes or for payments of wages in kind which is still prevalent in certain parts of the country, also call for improving storage facilities. Further farmers have inadequate storages facilities and usually compelled to sell their grain soon after harvest, when prices are low for fear of it spoiling later.

Storage losses can be divided into several categories: Quantitative loss is physical loss of substance (i.e. reduction in weight or volume) and so can easily be ascertained. Qualitative loss however is more difficult to assess but can often be determined by comparison with locally acceptable standards (O'kelly, 1979). Nutritional loss may be a contamination of both. There can be also wholesomeness or hygienic loss due to contamination of the grain, in the store, whether of microbial, insect or small animal origin. Aside from consideration of good health such contamination in turn can lead to economic loss because less money will be received from grain of poor quality (O'kelly, 1979).

At the time when gender issues are of current interest the need for improving food storage and processing so as to lessen the burden on women is even more. Since in most developing countries it is the women who are largely responsible for drying and storing and other processing(threshing, winnowing husking, shelling and milling) necessary before the grain is fit for consumption. These arduous and time consuming tasks leave many of them prematurely aged. Good grain storage is one of role played by GMGBs that Small farmers' groups like GMGBs have important role in achieving rural development in general and food security in particular.

2.9 The Role of Group Managed Grain Banks in Rural Food Security

The enduring hold of grain bank model lies in its appeal as a 'win-win' option, satisfying both efficiency and equity criteria. In rural areas with poor roads and weakly integrated to markets, grain banks may be the main option available for food security. The grain bank model is simple, relatively cheaper to establish, locally based and managed by those who benefit, it is participatory, and it does not create dependency, but instead promotes community ownership (Yameogo, 2007).

The roles of Grain Banks in rural food security are well documented (Reddy, 2007; Madiath and Padma, 2007; Yameogo, 2007; Madaha, 2007). Many studies show that Grain banks were introduced in poor community as alternative food security programme in Asia and Africa. In these communities, agricultural practices are controlled by behaviour of weather conditions especially rainfall; both failures and excess rains impact them adversely. Often these uncertain adverse conditions approximate to famine conditions (Reddy, 2007).

In India grain banks were introduced in Orissa state in 1975 with the aim of uniting the community to fight the common problems of food insecurity (Madiath and Padma, 2007). Its coverage in Orissa state extends to twelve districts working with poor and marginalized communities in over 200 villages (Madiath and Padma, 2007). One of important spin-off of grain banking programme in Orissa state was increased awareness and confidence in the people, they are no longer dependent on moneylenders to tide over difficult periods. While in Maharashtra state, eleven groups implemented Grain bank programme in different Villages. In this state Grain banks were designed to cope with the nutritional needs of the disadvantage sections that lack food grains until such time they can repay from their own resources (Reddy, 2007). Reddy (2007) pointed that, the lack of entitlement of such communities are known to force them into debt traps in lean season prior to the first monsoon harvest. Money lenders, either lend cash or grain at prohibitive rates of interest. Thus Grain Banks as an alternative food security system make available grains to these poor families in lean season through lending at affordable interest rates thus eliminating the stranglehold of profiteering of money lenders. One important outcome was increases awareness and confidence of the people. The same people who were once reluctant to save are now prepared to take loans for livelihood purpose and even repay in time. Hence it is clear that by satisfying the basic need of food on assured basis, grain banks have provided leverage to eject people out of the orbit of poverty to more secure and dignified quality life (Madiath and Padma, 2007).

In Africa Grain banks have been used in Sahel region which is prone to severe food shortages due to arid condition. Governments introduced grain banks as village based solution to alleviate critical food shortages in those areas. In Burkina Faso since 1980's when there were several years of famine, churches supported the setting up of more than

100's grain banks in villages particularly in the north east part of the country on edge of Sahara desert (Yameogo, 2007). One achievement of grain bank reported is improved local food security in that part of the country by making food supplies available at the hardest time of the year at an affordable prices (Yameogo, 2007). This experiences from Burkina Faso signify that such small organizations (i.e. grain banks) are very effective once people are aware of the problem of food security and united in finding the common solutions. Further stressed that governments or development partners should provide credit, training and technical advices to enable them to manage their own food security (Yameogo. 2007).

In Tanzania, Grain banks were initiated by farmers group with the support of NGO called LVIA in Dodoma region. The fist grain bank was started by Nyota njema group at Chitego village in Kongwa district in 1998 with financial support from LVIA (Mtwale, 2002). Later on several grain banks were introduced in Manchali, Kinangali, and Mgunga and Mlowabarabarani in Chamwino District. LVIA in collaboration with village governments spearheaded the Grain bank formation in most villages with bank by construction of storage facilities (Godowns), each with full capacity of storing 120 tones. INADES formation provided capacity building training while LVIA contributed the initial capital for community food (LVIA, 2005). Ngomai grain bank which started in 2003 is exception to this, because it was purely initiated by small farmers group and its operations financed from members contribution to date. According to Dodoma region secretariat reports, grain banks were established to address the food security need of rural community. Therefore the main objectives of Grain banks can be summarized as

- To ensure food security;
- To improve bargaining powers;
- Savings and credit services;

- To provide adequate and storage facilities for food produce;
- To instils habit of proper utilization of food produce and avoid or minimize misuse of food produce such as excessive use of cereals in local brewing, use of cereals in exchange for local brew or in other unnecessary expenditures;
- It is a mean to unite small farmers and organize them so that they can take advantage of economies of scale in marketing of their produces and inputs delivery (RAA, 2005).

2.9.1 Functions and constraints of grain banks

The principle goal of grain banks is to ensure food security of their members and the community around, that is village community. In discharging this grain banks use a multipurpose approach. Mobilizing savings in kind that is collection of grain in banks and store for future use. Under this programme, in the beginning each member contributes 100kg (one bag) or more grain amount as their initial share. The amount of grain per share is determined by Management Committee. The contributions of 35kg per share have been reported in India while in Tanzania the amount of 100kg (one bag) per share is common in most Grain banks. The contribution through share is aimed at generating the grain bank capital. Also it's the criterion used by management to determine amount of grain loan for members. Members and villagers are free and indeed are encouraged to store any amount in the banks in return the banks charge storage services per bag. The storage charge differs from one bank to another in one hand, and between member and non member, but ranges from 10% to 20%.

Grain stocking up is another important function of grain banks, using capital generated from share contribution and other sources, the banks purchases grain during high seasons when prices are low to be able to accommodate future needs. During time of difficult or

rather food shortage, members as well as non members take loan from the grain bank and return it after harvest season. The interest charged for food loan differ, 25% interest have been reported in India (Reddy, 2007). In Tanzania, the interest charged for members' ranges from 5% to 50% while for non members' ranges from 20% to 100% (Researcher's field report, 2009). Every year they (members) also increase their shares as such, the capital of the bank increases each year. Besides providing credit in kind (food loan) GMGBs also provide members with credit service (cash) under market stabilization scheme. When a member is in dire need to address other social needs, he/she requests cash loan using grain as collateral, particularly during harvesting time when the prices of food crops are low. The bank retain those grain until low season (prices are high) when it sell. After the sales of collateral produce the amount advanced as loan is deducted and the remaining revenues is divided by equal proportion (50%) to the member and the grain bank. The aim of Grain bank to provide cash loan is to help its members not to sell their food crops at low prices and to provide alternative cash loan against local lenders

Another important service is the provision of agricultural inputs on credit basis; the most delivered input were oxen implements (Madaha, 2007). Regarding marketing, most grain banks sale their stored produce at village level market since the aim is to improve food supply at village level in general and household level in particular. Ngomai grain bank is exception to this, because it market part of grain at Kibaigwa International market. This is possible for Ngomai Grain bank because it's relatively near to that market and relatively linked with good road. In general both horizontal and vertical market integrations are still weak or none. Extension services, access to relevant information and opportunity for training are other benefits enjoyed by members of grain banks.

2.9.2 Organization and membership

GMGBs organization is based on democratic principles, hence the management team has to be democratically elected by members and every member is legible to elect and to be elected. The management is responsible for mobilizing savings and financial resources needed for smooth operation of the bank. It is also responsible for overseeing lending procedures and monitoring loan repayment. It's the management team which is responsible for day to day activities, and ensuring that the management and members meet regularly as required by the bank's constitution. In each year the management has to provide members with financial report and bank plan for the next year. Membership is voluntary, provided that one meets specific criteria as required by the bank constitution like age, and entry fees (Mtwale, 2005).

Enough capital is also necessary for discharging credible service, most of the grain banks are financially weak, either way loan repayment have been documented as limiting factors. One reason for this can be explained by attitude of community who regard donor support as gift (Madaha, 2007). Another reason is associated with the nature of small farmer agricultural activities which is exposed to weather shocks, sometime leading to total loss of capital invested. In such situation it is unrealistic to expect the farmer to payback the loan. Although it's equally true that high rate of loan defaulting can result due to either weak leadership or lack of proper measures to deal with defaulters. Failure to take actions encourage more loan defaulting.

2.9.3 Grain bank in food supply consistency and security at household level

Food supply can be considered as indicator of food security at household level. One source of food supply is own household production. Assuming other factors remained constant,

household food productions depend on size of area cultivated, size and productivity of household labour (Mkunda, 2005). Making further assumption by keeping other factors constant it's true that well fed labour has higher productivity level than hungry ones. Grain banks through providing food loan at affordable rate in shortage period ensures that the household has constant and reliable supply of quality labour as such there is enough labour and time for farm operation. The level, quality of labour and time spent in farm activities have direct bearing on food production of a given household. Grain bank services have also minimized problems of villagers being forced to work as labourers in search for food and labour migration has been checked, the general effect is increased food production hence improved food availability.

Another important measure of grain banks is provision of free food to destitute households. In collaboration with village leaders the families in dire need are identified and provided by food assistance. Grain banks offer buffer stocks during seasonal shortages to the community. More still provision of inputs and credit, facilitating access to extension services and relevant information all have positive impact on agricultural production. This facilitates transformation of tradition agriculture to modern or commercial one (i.e. high productivity).

2.9.4 Operation performance of grain banks

Indicator of grain banks performance can be devised according to need. The ways the Grain banks function or operates to much extend determine the level and quality of the services in meeting its obligations. With difficult legacy of cooperatives in mind the major questions to be asked are; if they are independent, competent business entities and democratic, these are important questions in order to win back the trust of people

(URT, 2005). It is only when they meet most of these questions then they can become dependable and reliable food security instrument in rural areas.

Independent refers, free from interferences of external forces, which can be government at any level i.e. village government, district or region which can influence decisions or manipulate grain banks in favour of their interest, for example for political gain. Decision on matters of interest to core value of the grain banks must be decided by members only. Full participation in decision making, in every stages of grain bank operation by members signifies level of democracy.

Grain bank management must be selected democratically to win trust and legitimacy of members and the community at large. Sensitive, responsible, accountable and committed leader build trust and become role models for other to follow (Jost *et al.*, 2006). Experiences shows that the necessary faith and motivation is best created by local leaders who posses first hand knowledge of local people intimately and share with them the same problem and aspirations. All these factors enable them to influence the minds and thoughts of people and thus to motivate them towards cooperation action (Wambura and Rutatora, 2005). According to Gas forth (1993), cited by Madaha, (2007) for every successful group there must be a key individual behind this success, a person who took first step in the formation of a group. A personality which conveys enthusiasms and confidence, willingness to devote time and energy to the group and the wider community, a vision which sees a possible solution to a long acknowledged problems or recognizes an opportunity which no one has yet exploited and an ability to share vision with others.

A proper record keeping is essential in managing grain bank resources and enables the management to monitor progress. The management must meet regularly to oversee grain bank operation and that all committees required for smooth running be in place and functional. Sustainability of grain bank is crucial, but this is only possible if it is able to meet its obligation and generate excess revenue (profit). Farmer's group involve costs as well as benefits, only when the differences is positive will cooperation occur and will be sustained if it can generate enough cash income or in-kind contributions such as labour to cover its running costs in the short run and have enough left over to invest in growth. Having a 'positive cash flow', may be enough for farmer's group to 'stay in business' it is not to guarantee its sustainability (FAO, 1999, cited by Madaha, (2007). Profitability shows competitiveness of the business and that it can pay all operation costs and generate excess revenues for capital accumulation. Therefore profitability is the most important measure of Grain bank performance

Studies which were conducted in Sahel on small Farmer grain banking, reported profit ranging from 13% to 20% (Van Wijk, 1993, cited by CTA, 1999) and revealed that grain banks often have stabilizing effect on price level. Other study in the same region of Sahel reported profit margin ranging from 1% to 15% (Van Alterna 1997, cited by CTA, 1999). In Tanzania, the study carried out in Chamwino district reported increased living standard as was indicated by the increase in mean income of member households from Tsh 194 030.28 to 357 456.34 in three year's time and that there was remarkable dietary diversity and the frequency of meal improved from at least 1 to 3 per day. Productivity of maize increased from 11.7 to 28.73 bags per hectare (Madaha 2007) as a result of Grain bank intervention, these results signify that grain banking has important role to play in rural food security.

CHAPTER THREE

RESEARCH METHODOLOGY

This section consists of brief description of study area, research design, population unit, sample size; means of data collection and data analysis tools.

3.1 Study Area

The study was conducted in Dodoma region, the region lies between 4° 49' and 7°00' south and 36°56' and 35°55' longitude east. Total area of the region is 41 311 km²; the main stay of the people is agriculture. Crops production is major activity, while livestock keeping is the second important. Crops grown include maize, sorghum, finger millet, and legumes. Because of semi arid condition the region is considered as hunger prone, hence food security systems are vital. Kongwa and Chamwino districts are suitable for conducting the study for grain banks due to accessibility and that they are prone to food insecurity.

3.1.1 Chamwino district

The district is located in the central plateau of Tanzania. The district has a dry savannah type of climate, which is characterized by a long dry season lasting between late April to early December, and a short single wet season starting in mid or late December and ends early April. The average rainfall is about 500-800 mm annually, and about 85% of this fall in the four months between December and March. The rainfall is relatively low and unpredictable in frequency and amount; this represents a serious constraint for food production. Crop production is scattered all over the district, the main crops grown are sorghum, millet and maize which is grown in Mpwayungu and Itiso divisions where rains is relatively higher. Other crops include paddy, beans, groundnuts, simsim, sunflower and castor. Also production of tomatoes, onions, fruits and other vegetables are grown in small

scale. Livestock keeping is equally important, according to 2005 Livestock census, there was 185 659 cattle, 45 264 goats, 9904 sheep and 3820 pigs (Chamwino DC, 2009). Chamwino district has 12 grain banks.

3.1.2 Kongwa district

The district is located in Dodoma region. Other districts in the region are Kondoa, Mpwapwa, Bahi, Chamwino and Dodoma municipal. Kongwa district covers 4041 square kilometres with a population of 248 656 people where 119 418 are male 128 239 are female (URT, 2002). Administratively Kongwa district is divided into three divisions namely Zoissa, Kongwa and Mlali with Fourteen wards and 67 villages.

The main stay of the people is agriculture. Crops production is the major activity, while livestock keeping is the second important occupation for the majority. Crops grown include maize, sorghum, finger millet, and legumes. Livestock kept include cattle, goats, sheep and pigs. The district has two ecological zones, based on rainfall and agronomic factors. These are maize belt and sorghum belt respectively. The maize belt occupies the whole division of Mlali and major part of Zoissa division. The soil is relatively fertile and receives rainfall between 600mm to 800mm per annum; being relatively suitable for maize growing the area is the powerhouse of Kongwa cereals production, making it among big cereals producers in the country. The famous Kibaigwa grain market is located in this area. The sorghum belt occupies Kongwa division and Hogora ward. The area is relatively dry with rainfall between 400mm to 600mm per annum; as such only drought resistant crops have big chance of being harvested. Crops grown are sorghum, millet, groundnut and pulses (Kongwa DC, 2009). The district has 2 active grain banks.

3.2 Research Design

Case study research design was used in this research. The case study was adopted because, is suitable in understanding complex issues like food security, and can extend experience or add strength to what is already known through previous research (Yin, 2002, cited by Madaha, 2007).

A key strength of the case study design involves using multiple sources and techniques during data gathering process. The data to be gathered and techniques to analysis these data are determined well in advance in order to answer the research questions. A case study design allows young researchers to learn how to use many techniques in the data gathering process. Data are collected through interviews, documentary review, observation, focus group discussion and even the collection of physical artefacts. During data collection, 100 respondents were interviewed mostly head of household. Data were collected in four villages namely, Chinangali, Manchali, Ngomai and Chitego.

3.3 Administration of the Instrument for Data Collection

A structured questionnaire composed of closed and open ended questions was administered to collect both quantitative and qualitative data. To improve consistency and reliability, the questionnaire was pre-tested under field condition to ascertain any shortcomings, which were amended.

3.4 Sampling Procedure

Purposive sampling was employed to select relevant district departments and villages with grain banks. Purposive sampling was supplemented by simple random sampling in selecting the respondents from each village. Four villages were selected, two in each

district. The villages were Manchali and Kinangali in Chamwino district. In Kongwa the villages were Ngomai and Chitego. In each village respondents (members and non members) were selected through simple random sampling technique. Sample frame was member registration and the sampling unit was household heads. The sample size was 100 (50 members and 50 non members). For each respective village, the sample size was, Chitego 27, Kinangali 20, Manchali 23 and Ngomai 30.

3.5 Data Collection Methods

Both primary and secondary data were collected. Primary data was collected through administering structured questionnaires, supplemented by personal observation and group discussion to gather more information and for verification purpose. Secondary data was obtained from relevant institutions.

3.6 Data Processing and Analysis

Data collected was compiled, coded, cleaned and processed by using Statistical Package for Social Science (SPSS) computer programme.

3.6.1 Descriptive statistics

The socio-economic characters of respondents, functions and constrains facing the grain banking were analyzed by descriptive statistics including percentages and means.

3.6.2 Evaluation of food supply consistency and food security at household level

Food security is complex concept to be adequately captured by a single indicator. Furthermore it is important to evaluate it quantitatively as well as qualitatively. Considering this, three indicators were used these included Food Adequacy (FA), Energy

Adequacy (EA) and amount of grain available at a particular household here referred as Household Self Sufficiency (HSS). Food Adequacy (FA) and Energy Adequacy (EA) both are expressed as percent as suggested by FAO/WHO (1985). According to FAO/WHO (1985) a person needs 0.6 kilogram of cereals per day in order to meet calories requirements for subsistence life, around 219kg per year. The recommended daily energy intake is 2780 kcal per consumer unit. To evaluate FA and EA, various food crops were converted into a common unit, maize equivalent after subtracting all food crops which were sold. FA and EA consider household consuming less than 80 percent (<80 percent) as having deficit food and energy respectively, 80 percent-100 percent as consuming adequate food and energy (80 percent-100 percent) and more than 100 percent (>100 percent) as excess food/ energy. Therefore FA and EA were calculated as follows;

$$FA = \left(\frac{TP}{P \times T \times R} \right) \times 100 \quad (1)$$

Where;

FA= Food adequacy

TP=Total food stock expressed in maize equivalent

P=Household size (Expressed in adult equivalent)

T=Total days in year (365)

R=Food requirement (0.6 kg of cereal per person per day)

$$EA = \left(\frac{TP \times K}{P \times T \times R} \right) \times 100 \quad (2)$$

Where;

EA=Energy adequacy for each individual in household (%)

K= Energy density of maize (All food was converted into maize equivalent)

R = Required amount of 2780 Kcal/consumer unit/day

Maize equivalent scale

$$R = \frac{EFP}{EDM} \quad (3)$$

Where;

R=Ratio

EFP= Energy of food produced to be consumed (Kcal/kg)

EDM= Energy density of maize (Kcal/kg)

Food security department under the Ministry of Agriculture, Food Security and co-operatives (MAFS) and some studies in Tanzania (Ishengoma, 1998; Mosha, 1990) have suggested the amount of 3bags per person per year, for direct consumption.[1bag in this study=100kg]. This is Household Self- Sufficiency (HSS) calculated as follows: Total available cereal for consumption/Total family members (in adult equivalent). The rationale behind this suggestion is that the amount of 3bags is more realistic in rural settings, example issues related to extended family and other tradition norms which influence extravagant use of food. Practically it's easier and understandable to be used by the respondents for their future plans in household food security. Furthermore is needed to offset losses which occur during storage, processing and handling. Although in this study three indicators are used to evaluate household food security [FA, EA and HSS as indicators of household food balance] much emphasis was given to HSS as per reasons above. Under HSS three categories were used. Those are HSS < 3bags/consumer unit/year considered as food deficit, HSS= 3bags/consumer unit/ year considered as adequate food balance, HSS> 3bags/consumer unit/year, considered as excess food supply. As aforesaid all food crops were converted into common unit maize equivalent, after subtracting food crops which were sold.

3.6.2.1 Equivalent scales

Maize Equivalent Scale (MES)

Amount of maize needed to supply the same amount of calories as the food in consideration. This is calculated by multiplying the ratio of that food; for example if the household has 200kg of sorghum the MES will be $0.97 \times 200/1 = 194\text{kg}$ of Maize.

Table 1: Maize Equivalent Scale (MES)

Type of food crop	² Ratio	¹ Energy
Sorghum	0.97	3350
Rice	0.99	3350
Millet	0.97	3200
Bean	0.93	3200
Maize	1.00	3450

Source: West *et al.* (1988)

¹Energy content of edible portion of each food in kcal/kg

²Ratio= Energy of produced food to be consumed (in kcal/kg)/Energy density of maize
(in kcal/kg)

Adult equivalent scales

Adult equivalent scale involves grouping household members in age and sex categories (Berck and Bigman, 1993).

Table 2: Adult equivalent scales

Age group (yrs)	Unit equivalent
Infant 0-10	0.36
Children 11-15	0.75
Adult over 15	1.00

Adopted from Tedford *et al.* (1986)

After adult equivalent scales per each household were calculated then evaluation of food balance was done based on HSS. Household revenues derived from agricultural sources which are economically quantifiable were included in the analysis. T-test analysis was done to compare food security level between Grain bank member households and non member households. Chi-square was computed to compare average means of food security status among villages (variation in food security level).

3.6.3 Grain bank and household food security

Linear regression was used to determine the role of grain banks in household food security. This is because regression model $Y=(x_1 \dots\dots x_k) + \epsilon$ denotes the specification of how the conditional means $E(y/x_1, \dots, y/x_k)$ are related to each other through x . The population regression function written as $E(y/x_1, \dots, y/x_k) = g(x)$: describes how the average or expected value of y varies with x . Based on this relationship, linear regression equations for this study were specified by estimating regression statistic for three different estimation regression models where Grain bank services (Loan seeking from grain bank and number of bags stored) and household resource (Total area cultivated) were predictor variables. A separate model was formed for each dependent variable. The model was specified as

$$y = \alpha + \sum \beta_i x_i + \epsilon \quad (4)$$

Where;

x_{ij} are Grain bank services((Loan seeking from grain bank and number of bags stored) and household resource (Total area cultivated)

y is Food Adequacy(FA), Energy Adequacy(EA) and Household Self Sufficiency (HSS)

α and β parameters estimated

3.6.4 Definition of variables

Dependent variables

- Food Adequacy (FA) - refers to availability of food for all members of the household, nutritionally safe and culturally acceptable. It's expressed as a ratio in percent. FA was adopted to measure food balance and supply stability at household level.
- Energy Adequacy (EA) - refers to nutritional value of food required to sustain body energy need. It is expressed as a ratio in percent
- Household Self Sufficiency (HSS) - refers to amount of food available for consumption at a particular household for one year, measured in bags (1bag= 100kg).

Independent variables

- Loan seeking (Loan access)-ability to access and acquire loan at right time. Loan has catalytic role in modernization of agricultural production. It is expected to have a positive impact to all three dependent variables.
- Number of bags stored- refers to the amount of grains stored by respondents in Grain bank as food savings for their future use, measured in bag. Amount of food stored ensure food supply and stability at household level. Improving accessibility and availability of food has positive impact on level and quality of labour. It is expected to be significant and to contribute positively to all three dependent variables.
- Total area cultivated-refers to proportion of farm with crops, under subsistence agriculture, output increases has been largely due to land expansion, as such the expectation is that the variable will have significant and positive contribution to all dependent variables.

3.6.5 Analysis of operation performance

Analysis was done using prices received and cost involved as indicators of relative performance. The profit margin was calculated to determine the profitability of each grain bank operation.

$$PM = TR - TVC \quad (5)$$

Where;

PM = Profit Margin

TR = Total revenue

TVC = Total variable cost

3.7 Validity and Reliability of the Study

The limitations of research study with regard to its validity and reliability lies on the inadequate resources especially fund and also on data collection which depends on respondent's memory. In some cases important documents and records were not easily available due to improper record keeping. To overcome these limitations, the researcher employed combination of research techniques deliberately to improve both validity and reliability of the study. The researcher in this study was assisted by two assistant enumerators in each village, whom were first trained in order to understand the objectives of the study and to improve their interviewing skills so as to smoothen the exercise.

A draft questionnaire was pre-tested on 20 respondents from different areas within the study area. The results of pre- test helped in restructuring the final questionnaire to specifically answer the objectives of the study. This was done by paraphrasing or rephrasing questions that were unclear to both respondents and assistant enumerators, incorporating missing variables and omitting irrelevant questions hence standardised

questionnaire was used in data collection. This reduces time and effort required from respondents. Respondents were informed in advance, that they will be visited by researcher. In each village before interviewing process start, the researcher introduced the study and explained why was important and useful to them. All these were designed to motivate and encourage the respondents to respond positively. Another measure was broadening the sample size up to 100 respondents which was thought to be reasonable representative sample.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Household Characteristics

Socio-economic characteristics of a particular household have important implications to the accessibility and availability of food within a given household. Decision on production, consumption and storage of food are influenced by the composition of household. This section describes household characteristics with much emphasis on marital status of household head, education level of household head, household size and age composition. These variables are examined in relation to household food security.

4.1.1 Marital status of respondents

Married in this study means union of a male and a female, it include both formal and informal unions, and was categorized as single, married and separated. Table 3 presents the results of marital status of respondents. The results show that about 78 percent of all households are headed by married heads, 20 percent by single female heads and 2 percent of households are headed by separated heads.

Married couples are likely to be more food secure than single person because of high labour reinforcements in accomplishing farm operation (Mkunda, 2005). Table 3 shows different social characteristics of sample households.

Table 3: Social characteristics of households

Characteristics	Village				Total
	Ngomai	Chiteg	Manchali	Kinangali	
Sample size	30	27	23	20	100
Marital status (%)					
Married	24	20	19	15	78
Single	6	7	4	3	20
Separated	0	0	0	2	2
Education level (%)					
Primary	28	23	19	20	90
Secondary	2	0	0	0	2
Certificate	0	1	0	0	1
No formal	0	3	4	0	7
Average household size	6.0	6.3	5.9	6.1	6.1
Household composition (%)					
< 10 years	18	20	11	8	14.25
11 to 15 years	44	41	44	46	43.75
Over 15 years	38	39	45	46	42.00
Dependency ratio	1.83	2.15	1.79	1.70	1.87

4.1.2 Education level of respondents

Education is the most important input for human capital. Generally, a household with a head without formal education is likely to be more prone to nutritional problems than a head having at least primary education. However, although the knowledge in food budgeting and rationing is important for household food security, education for control of seasonal food insecurity is not necessary formal (Njiro, 1997).

The results reveal high rate of literacy that 90 percent of respondents had primary education, 2 percent of household heads attained secondary education, 1 percent with certificate courses and only 7 percent of household heads had no formal education. This

high rate of literacy (93 percent) signifies that education is not a problem in food budgeting and rationing for household food security. Regarding food security, results as demonstrated in Table 4 shows that 61 percent of respondents with primary education had excess food and 39 percent had food deficit. All respondents with secondary education and certificates had excess food supply. This is in line with the description given above. About respondents with no formal education only 29 percent had food deficit (2 out of 7) and 71 percent had excess food supply. The explanation to this surprising result is that, these respondents are likely to be aged with wealth of experience in dealing with seasonal food shortages. Furthermore, aged individuals have relatively great chances of owning more resources than young ones (Land, livestock). Command on more resources offer big opportunity for these households to be food secure, regardless of the level of education of a household head.

Table 4: Influence of education level on food security

Level of education	HSS food category	
	< 3 bags/ adult equivalent (in percentage)	≥ 3 bags/ adult equivalent (in percentage)
Primary	39.0	61.0
Secondary	0.0	100.0
Certificate	0.0	100.0
No formal education	29.0	71.0

4.1.3 Household size

Household size has important implication in household food security planning. In rural areas, people eat what they manage to produce, store and prepare (Johnson, 1986), therefore keeping other factors constant, the amount of food per meal per person is closely related to the number of persons sharing that particular meal. Table 3 shows results of household size of respondents. The overall average household size was 6.1. Village wise the average household size was 6.0 for Ngomai, 6.3for Chitego, Manchali 5.9 and

Kinangali 6.1. The average household size for Ngomai (6.0) and Manchali (5.9) were smaller compared to the overall average (6.1) while the average household size for Chitego (6.3) was slightly higher than the overall average. The result for Chitego can be attributed to the village having livestock keepers with large herds who in most cases are polygamist hence large family size.

Overall number of persons per household ranged from 2 to 18 persons. In general 10 percent of all households had 1-3 persons, 35 percent of households had 4-5 persons, 35 percent of households had 6-7 persons and about 20 percent of households had more than 7 persons. Cross tabulation of household size with HSS as shown in Table 3, indicates that 63 percent of households had sufficient food and 37 percent had insufficient food.

Cross tabulation results (Table 5) of household size category and EA show that 27 percent of households were consuming less energy (<80 percent), 10 percent of households were consuming adequate energy (80-100 percent) and 63 percent households had excess energy supply (>100 percent).

Table 5: The influence of household size on food security (EA)

Household size category	Energy adequacy category (%)			Total
	<80	80 – 100	>100	
1-3	4	0	6	10
4-5	7	3	25	35
6-7	9	4	22	35
>7	7	3	10	20
Total	27	10	63	100

4.1.4 Food security and village of household head

Cross tabulation analysis shows that at Ngomai village 13.3 percent had less FA, EA and HSS, while 86.7 percent of households had excess FA, EA and HSS. The good result of Ngomai is direct related to the good performance of Ngomai grain bank this signify that grain bank have important role to play. At Chitego the number varies across food security indicators that 18.5 percent of households had less FA, 22.2 percent of households had less EA and 37 percent of households had less HSS. On the other hand, 3.7 percent had adequate FA and 77.8 percent had excess FA. While 14.8 percent had adequate EA and 63 percent had excess EA. Regarding HSS 37 percent of households in Chitego village had food shortage and 63 percent had excess food.

For Manchali the results differ slightly with this of Chitego village. About 21.7 percent of households had less FA and 78.3 percent had excess FA. With regard to EA, 26.1 percent of households were consuming less energy; 8.7 percent of households were consuming adequate EA and 65.2 percent of households had excess EA. For HSS, 35 percent of households had food shortage, while 65 enjoyed excess food supply.

In Kinangali village the situation is more serious compared to other villages, 45 percent of households had less FA, 10 percent had adequate FA and 45 percent of households had excess FA. On energy basis, 55 percent of households were consuming less energy (<80 percent), 20 percent had sufficient energy for consumption (80-100 percent), and 25 percent had excess EA (>100 percent). On HSS basis, 75 percent of households had food shortage (<3 bags/consumer unit/year) and only 25 percent of households had sufficient food (equal or more than 3bags/consumer unit/year) The Chi- square tests for FA, EA and HSS across villages shows that there is significant difference in FA, EA and HSS (Table 6).

Table 6: Food security indicators cross tabulation results

Indicator	Village				Total
	Ngomai	Chitego	Manchali	Kinangali	
FA category*					
<80%	4	5	5	9	23
80%-100%	0	1	0	2	3
>100%	26	21	18	9	74
EA category**					
<80%	4	6	6	11	27
80%-100%	0	4	2	4	10
>100%	26	17	15	5	63
HSS category**					
<3bags	4	10	8	15	37
>3bags	26	17	15	5	63

*FA Chi-square value 13.612 significant at $p < 0.05$

**EA Chi-square value 21.052 significant at $p < 0.01$

**HSS Chi-square value 19.647 significant at $p < 0.01$

4.2 The Functions and Constraints of Grain Banks

4.2.1 Functions

When respondents were asked what is the most important service of grain bank, about 37.2 percent mentioned good storage, while 30.2 percent indicated food saving for food security as important service to them, and about 27.9 percent mentioned food loan access, while only 2 percent indicated training as important service.

4.2.1.1 Grain Bank food savings

Under GMGB savings is normally done in grains, every member save certain amount of his/ her food produce which is stored in the bank for future use. The amount to be contributed depends on the amount harvested in that particular year and the size of that

particular family. The amounts vary but members are encouraged to contribute in each year for their household food security.

Table 7: Bank savings for 2007/2008

Type of saving	Amount(bags)			
	Manchali	Ngomai	Chitego	Kinangali
Food	118	158	50	-
Seeds	29	-	9	-

4.2.1.2 Grain bank food loan

Food loan is extended to any community member in critical need of food (member/ non member) under the community food loan. For this loan the interest charged vary from one bank to another, 20 percent for Ngomai Grain bank (20 kg per 100 kg bag) to 50 percent for Chitego, Manchali and Kinangali, for the period of one year.

Manchali GMGB community food loan

Table 7 shows record of food which was provided since 2003/2004 season to 2006/2007. Between 2003/2004 and 2004/2005 loan repayment rate (compliance ratio) was very low. To address this management thought a strategy which demanded any household in need of food loan must be grantees by a member, whom would be responsible for monitoring loan repayment. The strategy had positive impact as demonstrated in Table 8, the compliance ratio improved from the lowest (31 percent) to the highest (97 percent).

Table 8: Manchali community food loan for 2003/2004 to 2006/2007

Season	Amount issued	Number of beneficiary	Bags/HH	Expected repayment	Actual repaid	Compliance ratio (%)
2003/04	214	117	1.8	312	242	75
2004/05	158	209	0.7	237	74	31
2006/07	137	126	1.1	205.5	200	97
Total	409	452	0.9	763.5	516	67.6

Chitego GMGB community food loan

Chitego Grain bank had been providing food loan to the community since late 1990s. However, despite this good initiative, loan repayment rate (compliance ratio) is not encouraging as it can be seen from Table 9. The general trend has been fluctuating around low level with downward trend. This highlights the worsening performance of the grain bank. The low repayment rate can be attributed to the attitude of people toward loans especially if the is element of external support. In most cases people regards this as gift from white man therefore no need to pay back. Another serious problem is lack of good leadership which instead of overseeing smooth operation of bank, tampers with banks resources, leading to loosing trust of members and the community.

Table 9: Chitego community food loan for 2004/05 to 2006/07

Season	Amount issued	Number of beneficiary	Bags/HH	Expected repayment	Actual repaid	Compliance ratio (%)
2004/05	136	120	1.1	204	160	78
2005/06	162	191	0.8	243	182	75
2006/07	120	130	0.9	180	92	51
Total	418	441	0.9	627	434	69

Consequently such leadership can not be able to mobilize the community to pay back loan.

Weather condition especially rainfall distribution equally affect loan repayment because small farmers depend solely on rain fed agriculture.

Ngomai GMGB

GMGBs Ngomai. Grain bank offers food loan to the community. Table 10 displays results for the period of 2004/05 to 2006/07. From the figures, it's clear that there is good repayment rate with the average rate of around 90 percent. This signifies good performance of the bank during the period of 2004/05 to 2006/07. The good performance of Ngomai is a result of true local effort through organizing themselves to mobilize necessary resources to form and operate the grain bank. Ngomai is the only grain bank which did not receive external funding.

Table 10: Ngomai community food loan for 2004/05 to 2006/07

Season	Amount issued	Number of beneficiary	Bags/HH	Expected repayment	Actual repaid	Compliance ratio (%)
2004/05	172	42	4.1	206.4	184	89
2005/06	131	52	2.5	157.2	157.2	100
2006/07	307	55	5.6	368.4	348	94.5
Total	610	149	4.1	732	689.2	94.4

Kinangali GMGB

While the performance of Chitego Grain Bank and Manchali Grain Bank is moderate, the performance of Kinangali Grain Bank has been very poor. The community food loan is no longer in existent due to embezzlement of community food revolving fund. Poor leadership and hence poor record keeping was a reason behind of most important grain bank information being unavailable, that some of the analyses for Kinangali were not possible to perform.

4.2.1.3 Grain bank food storage

Good storage of grain has been one of important service offered by Grain banks. In Tanzania storage loss ranges between 20 percent and 40 percent of total harvest (URT, 2007). Most serious storage loss is caused by pests such as rodents and larger grain borers. Considering the magnitude of storage loss, its clear that Grain banks serves a significant amount of grain through provision of good storage, and in doing so improve food security in area. Table 11 shows the amount of food stored.

Table 11: Storage services from 2004/05 to 2007/08

Season	Amount stored (bags)				
	Manchali	Chitego	Ngomai	Kinangali	Total
2004/05	Not available	809	231	212	1 252
2005/06	411	458	328	44	1 241
2006/07	447	367	342	-	1 156
2007/08	366	291	371	-	1 028
Total	1224	1925	1272	256	4677

4.2.2 Constraints

Poor management was mentioned to be the main problem (54%) for the failure of grain bank. Members as well as non members indicated this problem as chief causes for the collapse of most grain banks. Members of Kinangali GMGB claimed that their leaders have mis used fund donated by LVIA, which was intended for revolving fund to finance community food loan in 2005. This situation has led to operational problem, since there are no enough funds to enable the bank to stock grain for effective operation of community food loan. The main source of fund besides donation is to seek loan from financial institutions, for an association or any farmers group to qualify must have credible leadership. Capital was also a major constraint mentioned by respondents (45%).Enough

capital is necessary for financing bank operations such as stocking enough grain, purchasing agricultural inputs to be given to farmers on credits and meet cash demand for members(cash loan). Low compliance (1%) reduces the bank's ability to discharge its services.

Table 12: Main problem

Problem	Percentage
Poor management	54
Capital	45
Low compliance ratio	1

4.3 Regression Analysis Results

A linear regression analysis was employed to determine the relationship between food security and Grain bank services and selected household resource (Total cultivated area). The independent variables included are, seeking loan (using dummy variable=1 if seeking loan, 0 if otherwise). Number of bags stored by respondents and total area cultivated in hectare. The results obtained are as displayed in Tables 13 and 14 below.

Table 13: Linear regression results on the role of grain banks on household food security (FA and EA)

Variables	Coefficient	t-statistics	Probability
Loan seeking	71.449	1.949	0.054
Number of bags stored	24.290	9.291	0.000*
Total cultivated area	4.377	3.852	0.000*
R ²	0.665		

*Indicate significant at P< 0. 01)

Table 14: Linear regression results on the role of grain banks on household food security (HSS)

Variables	Coefficient	t-statistics	Probability
------------------	--------------------	---------------------	--------------------

Loan seeking	8.052	1.699	0.093
Number of bags stored	2.526	7.473	0.000*
Total cultivated area	1.673	11.391	0.000*
R ²	0.798		

*Indicate significant at (P< 0. 01)

Regression analysis suggests that the independent variables account for 79.8 percent of variation in HSS, and 66.5 percent of variation in FA and EA respectively. All three independent variables had significant regression coefficients implying that the variables effect on FA, EA and HSS is not by chance. The positive regression coefficient indicates that as amount of independent variables increases lead to high FA, EA and HSS, that is to say both had positive impact on household food security. In case of FA and EA, the number of bags stored by respondents was the biggest predictor while total area cultivated was the biggest predictor for HSS. Loan seeking had positive coefficient but was not significant in explaining variation in FA, EA and HSS. This can be attributed to low capital of Grain banks hence low amount of total loan disbursed. Number of bags stored as expected had positive coefficient and significant (p<0. 01) in explaining household food security. This is because as the number of bags stored increases enhances food availability as well as accessibility at household level. Better still good storage as described above, provides sufficient protection to the product maintaining its quality and quantity thus reducing product and financial loss, so storage helps to maintain domestic food security and maintain value.

As expected total area cultivated had positive coefficient and significant (p<0. 01) in explaining food supply consistency and food security at household level. Under subsistence farming, size of land cultivated is a critical factor in determining the amount of

crop harvests. About 80 percent increases of agricultural output in Africa have been attained through the expansion of cultivated area (Mkunda, 2005). The implication is that the total area which the family is able to cultivate per given year has great bearing in determining its food security level.

T-test result shows that food security status of grain bank member households are better than non- member households, and statistically significant at 0.1 level of significance. This outcome, reinforce the fact that, Grain Banks play a positive role in rural food security.

4.4 Profit Margin Analysis for Grain Banks

Profitability, among others, is one of the most important indicators of farmers' association/cooperative sustainability. Sustainability of Grain Banks is crucial, so that they can be dependable rural food security instruments. But this is only possible if they are able to accumulate enough capital (through generating profit) to meet their obligations. The following discussion shows account of profit margin analysis for three Grain Banks, Manchali, Chitego and Ngomai.

Manchali Grain bank received a total profit of 246400 Tshs in 2007/2008 season. Return per bag bought was 1125 Tshs and return per shilling invested was 0.045 Tshs. Table15 displays this result.

Table 15: Profit margin analysis for Manchali GMGB

Parameter	Parameter's value
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1.	Quantity of maize bought(bags)	219
2.	Buying price/bag	22 000
3.	Purchase costs (1)*(2)	4 818 000
4.	Transport costs	155 500
5.	Packing material costs	194 500
6.	Fare costs	141 000
7.	Fumigation costs	200 000
8.	Labour costs	163 000
9.	Allowances	261 600
10.	Other expenses	144 000
11.	Total costs incurred	5 447 600
12.	Average selling price/bag	26 000
13.	Gross revenue(1)*(12)	5 694 000
14.	Gross margin(13) –(11)	246 400
15.	Return per bag(14)/(1)	1125
16.	Return per shilling invested(14)/(11)	0.045

Chitego Grain bank accrued a total profit of 469 000 Tshs in 2007/2008 season. While return per bag was 2549 Tshs and return per shilling invested was 0.093 Tshs, which is slightly higher than that of Manchali grain bank. This is a result of prices differences of maize in one hand, sorghum and millet on the other. The fact is that consumers prefer maize and are ready to offer relatively higher price than to either sorghum or millet. At Chitego the main grain is maize while at Manchali the share of maize is very small, main grains are sorghum and millet. Table 16 below shows the results of Chitego.

Table 16: Profit margin analysis for Chitego GMGB

Parameter		Parameter's value
1.	Quantity of maize bought(bags)	184
2.	Buying price/bag	24 000
3.	Purchase costs (1)*(2)	4 416 000
4.	Transport costs	0
5.	Packing material costs	104 000
6.	Fare costs	54 000
7.	Fumigation costs	92 000
8.	Labour costs	22 000
9.	Allowances	121 000
10.	Other expenses	242 000
11.	Total costs incurred	5 051 000
12.	Average selling price/bag	30 000
13.	Gross revenue(1)*(12)	5 520 000
14.	Gross margin(13) –(11)	469 000
15.	Return per bag(14)/(1)	2549
16.	Return per shilling invested(14)/(11)	0.093

At Ngomai the total profit was 970 000 Tshs in 2007/2008 season, return per bag was 4058.6 Tshs, and return per shilling invested was 0.136 Tshs. Ngomai attained the highest values of all measures of performance, as aforesaid maize is more preferred to either millet or sorghum, Ngomai Grain bank deals mainly with maize. Compared to chitego, Ngomai has advantages of being near and well linked to Kibaigwa International Grain market where there many buyers as the result selling price are relative higher. Therefore accessibility to the market and economies of scale all had positive impact (see Table 17).

Table 17: Profit margin analysis for Ngomai GMGB

Parameter	Parameter's value
1. Quantity of maize bought(bags)	239
2. Buying price/bag	25 000
3. Purchase costs (1)*(2)	5 975 000
4. Transport costs	212 000
5. Packing material costs	352 000
6. Fare costs	0
7. Fumigation costs	108 000
8. Labour costs	112 000
9. Allowances	283 000
10. Other expenses	114 000
11. Total costs incurred	7 156 000
12. Average selling price/bag	34 000
13. Gross revenue(1)*(12)	8 126 000
14. Gross margin(13) –(11)	970 000
15. Return per bag(14)/(1)	4058.60
16. Return per shilling invested(14)/(11)	0.136

Generally it can be said that profit margins were influenced by cost incurred and selling prices. Prices were determined by type of crop and accessibility to the market, the role of access and size of market in determining prices is clear, as demonstrated by variation of prices among villages, this finding is similar to that of Ellis and Mdoe (2002) in Kilosa and

Morongo. Profit ranged from 4.5% for Manchali grain bank, 9.3% for Chitego grain bank, and 13.6% for Ngomai grain bank. The profit margin for Manchali bank is very low compared to the results obtained by Van Wijk and Van Alterna in Sahel region (13% to 20%) while this of Chitego Grain bank is slight lower and that of Ngomai Grain bank is similar to the minimum range (13%).

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The general objective of this study was to assess the role of Group Managed Grain Banks in ensuring rural food security for smallholder households. Specifically the study aimed to: describe the grain banks in terms of their functions and constraints, evaluate the contribution of grain banks on food supply consistency and security at household level and analyze operation performance of each grain bank. This chapter describes the major findings from which valid recommendations are made. The major findings are presented in the order of specific objectives of the study.

The first objective was to describe the grain banks in terms of their functions and constraints. The findings show that grain bank functions which significantly contributed to improve food security at household level are grain storage, grain savings, food loan and opportunity for training in crop production skills. Major constraints facing grain banks include poor management, inadequate capital and low loan compliance (low loan repayment rate).

Basing on these findings, the following conclusions have been made: with regard to functions (services provided) by grain banks, it is clear that demand for food loan is growing fast (as indicated by deteriorating food loan ratio), that it is unlikely to be met by grain banks in their current status, hence demand for strategizing. One strategy is to direct more efforts in mobilizing the community to increase the amount of grain stored and member savings and the banks to stock up enough grain, these will assist the grain banks to meet the demand for food loans during shortage period. This is possible without incurring

much costs due to the potential available, for example most grain bank godowns have capacity of handling 120 tones of grain.

Another important measure urgently needed is to ensure that members loan repayment compliance improve significantly. This will ensure that Grain banks have enough revolving fund to meet their obligations. Since, low compliance ratio signify, first weak/poor leadership and second, that there is still inherent risk with agricultural loans. Therefore establishing and strengthening good management is needed to overcome these constraints, such that it will come up with strategies which will improve loan compliance without jeopardizing the grain bank objectives. The initiative which was used by Manchali grain bank management is a good example to be taken seriously. Inadequate capital too can be the result of poor management, low commitment of members and poor institutional/government support.

To overcome capital shortage, grain banks needs to be more effective and efficient in their operations. Reducing unnecessary overhead costs by accomplishing some tasks through voluntary spirit, that money saved is directed to meet most pressing needs such as stocking up grain.

The second objective was to evaluate the contribution of grain banks on food supply consistency and security at household level. Findings are: Ngomai village had highest number of food secure households (86.7 %), Manchali (65 %), Chitego (63 %) and Kinangali (25 %) basing on HSS. From these findings it can be concluded that the performance of village based grain bank is direct related to the food security status of a given village. Further more regression results shows that services provided by grain banks

such as food loan, grain storage and management contributed positively on household food security. Hence it can be concluded that grain banks improve food security at household level through provision of affordable food loan, grain storage and management, and in doing so enables farmers and their families to have food at crucial times when they need it most and spent most of their time working in their farm. Consequently they are able to cultivate reasonable area due to quality labour and enough time spent on their farms; this enhances food security.

The third objective was to analyse operation performance of each grain bank as indicated by profit margin. The profit margins obtained were, 4.5% for Manchali grain bank, 9.3% for Chitego grain bank and 13.6% for Ngomai grain bank. The profit margins compare relatively well with the result obtained by VanAlterna (1997), cited by CTA, (1999) which ranged from 1% to 15%. But were relatively low compared to the result obtained by Van Wijk (1993), cited by CTA, (1999) in sahel region (13% to 20%) Farmer's group involve costs as well as benefits, only when the differences is positive and that it generate enough cash income or in-kind contributions such as labour to cover its running costs in the short run and have enough left over to invest in growth sustainability is possible. Having a 'positive cash flow', may be enough for farmer's group to 'stay in business' it is not to guarantee its sustainability (FAO, (1999) Cited by Madaha, (2007). Profitability shows competitiveness of the business and that it can pay all operation costs and generate excess revenues for capital accumulation.

Low profit margins in this case can be attributed to poor management and low capital investment hence unable to exploit the potential economies of scale.

Generally it can be concluded that grain banks as village-based solution to critical food shortages contribute positively in improving household food security provided they are well managed and provided necessary support by related support institutions. Providing credit, training and technical advice is sufficient to enable them to manage their own food security. However, there is still a need to develop and build on experience. These findings from this study reinforce that grain banks can be effective once small farmers are aware of the problems of food insecurity and united in finding solutions.

5.2 Recommendations

Basing on discussion and conclusions, the following recommendations are made:

- More effort should be devoted to mobilize the community to utilize fully services provided by grain banks especially grain storage and management by storing enough grain for their family in view of significantly reducing post harvest losses.
- Stakeholders should be ready to provide financial support to enable grain banks to meet food loan demand and input provision on credit basis.
- The management of grain banks are strengthens through training on operational skills to make grain banks viable village food security instruments.
- The government at all level (local/ central) should support and promoted grain banks as village based food security initiative through mobilizing the community to establish and run grain banks in effort to alleviate food insecurity particularly in hunger prone area.
- Self-help spirit be encourage and promoted as it create sense of ownership and commitment of local people to solve their food insecurity problem and is a foundation for sustainability.

- Grain banks should not be seen as famine relief as this will create a sense of dependency. Rather, they should be seen as the instrument of the community taking active steps to improve their own food security.

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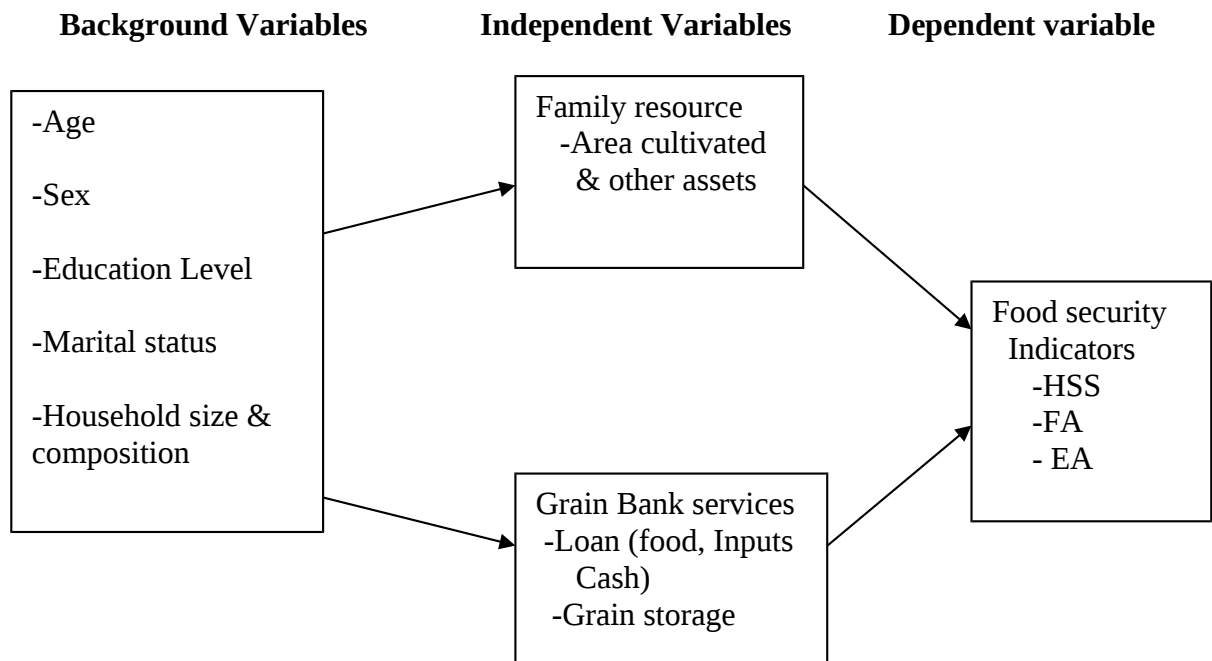
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APPENDICES**Appendix 1: Conceptual frame work**

Appendix 2: Farmers' Questionnaire

SECTION A: BACKGROUND INFORMATION

A1 No.....A2. Date of interview.....

A3 Village.....A4 Ward.....A5 District.....

A6 Sex 1. Male [] 2. Female []

A7 Age of a respondent.....years

A8 Marital status.....1 Single [] 2 Married [] 3 Separated []

A9 Household composition by age and sex

Age(years)	No. of male	No. of female
Children <5		
Children 5-18		
Adult > 18		
Adult> 60		

A10 Highest level of formal education

1 primary []

2 Secondary []

3 Certificate []

4 Diploma []

5 Others (specify).....

A11 Main occupation

1 Employee []

2 Peasant farmer[]

3 Petty trader []

4 Others (specify).....

A12 Are you aware of services offered by Grain bank?

1 Yes []

2 No []

- A13 If yes, what services do you use?
- 1 Seek food loan []
 - 2 Storage []
 - 3 Grain savings []
 - 4 Training []
 - 5 Others (specify).....
- A14 What other services could you wish Grain bank to provide you?
- 1 Agriculture inputs (specify).....
 - 2 Marketing.....
- A15 What is the most important service? (Mention).....
- A16 What are the main constraining factors for Grain banking?
- 1 Poor management []
 - 2 Adequate capital []
 - 3 Low compliance []
 - 4 Others (specify).....

SECTION B: GROUP MANAGED GRAIN BANK (GMGB) MEMBER.

- B1 Are you a member of GMGB? 1. Yes [] 2. No []
- B2 Is your wife/husband a member of GMGB? 1. Yes [] 2. No []
- B3 If yes, what is the advantages of both being members? Explain.....
- B4 When did you join the GMGB? Explain.....
- B5 Why did you join? Explain.....
- B6 Amount of grain contributed this season.....bags.
- B7 What benefits do you get? Explain.....

B8 Being a member of GMGB assist you in meet your daily food requirements?

Explain.....

B9 When did you join GMGB.....year

B10 Apart from Grain banking, does you're GMGB has other objectives?

1 Provision of inputs on credit basis

2 Marketing agricultural produce

3 Soft loan (food/ cash)

4 Storage services

B11 How do you rate your GMGB?

1. Very good []

2. Good []

3. Poor []

4. Very poor []

B12 Can you explain your rating.....

B13 What are the main sources of capital for your GMGB?

1. Member's contribution []

2. Loan from financial institutions []

3. Support from Government/NGOs []

4. Others (specify).....

B14 For this year did your GMGB received any funds? 1. Yes [] 2. No []

B15 Mention sources.....

SECTION C: HOUSEHOLD PERCEPTION OF THEIR FOOD SECURITY SITUATION.

C1 What is general situation of food availability for the past 12 months?

1. Very good (every member had enough to eat in terms of quality and quantity) []
2. Good (every member had been able to get enough to eat) []
3. Bad (sometimes facing problem of getting enough to eat) []
4. Very bad (facing problems to the extent of passing a day hungry) []

C2 If bad what are the main reasons for food shortage?

1. Low rainfall []
2. Poor storage []
3. Large family []
4. Inadequate labour []
5. Shortage of land []
6. Others (specify)

C3 How do you address food shortage in your household? Explain.....

SECTION D: FOOD AND SOURCE OF INCOME

D1 What is your source of income?

Source	Yes	No	Average income per year(Tsh)
Sale of crops			
Sale of livestock			
Petty trade			
Sale of labour			
Wage			
Others(specify)			

D2 Is your income enough to meet your household daily food need?

- 1 Yes [] 2. No []

D3 If no, explain how do you meet your daily household food needs?.....

D4 How many times do you take your meals? Please mention.....

D5 How many times do feed your under five years' old children?

1. Twice per day []
2. Three times per day []
3. Four times per day []
4. Six times per day []
5. More than six []

D6 What type of food do you normally use to feed your under five children?

Type	No/day
Protein	
Carbohydrate	
Vitamins	

SECTION E: FOOD PRODUCTION

E1 Mention type of crops that you grow in your farm.....

E2 What are you average farm size.....hectare

E3 What is the source of labour?

1. Family labour []
2. Hired labour []
3. Others (specify).....

E4 Please mention the average production cost per hectare

Type of operation	Cost(Tsh)
Clearing	
Cultivation	
Planting	
Weeding (sum of 1 st ,2 rd ...	
Harvesting	

E5 The area of farm you cultivated in 2007/2008

Crop	Area(hectare)
Maize	
Sorghum	
Millet	
Others(specify)	

E6 Cultivation method

1. By hand hoe []
2. By oxen powered implement []
3. By tractor []
4. Hiring tractor/ oxen []

E7 Where do you get farm inputs? (Please explain in terms of availability and price)

.....

E8 Types of seeds normally used

1. Local []
2. Certified []
3. Others (specify).....

E9 Do use fertilizer

1. Yes []
2. No []

E10 If yes, what type of fertilizer?

1. Organic fertilizer []
2. Farm yard manure (FYM)[]
3. Others (specify).....

E11 If no, explain why.....

E12 Average production of crops in 2007/2008 season

Crop	Yield (bags)
Maize	
Sorghum	
Millet	
Groundnut	
Sunflower	
Pulses	
Others (specify)	

THANK YOU FOR YOUR COOPERATION

Appendix 3: Grain bank interview guide

- Membership, organization, management and history of grain bank
- Main activities
- Motivation of members, leaders and autonomy.
- Source of fund/capital
- Institutional supports(if any)
- Government support(if any)
- Contribution in food availability and accessibility
- Access to credit(food, cash and inputs)
- Factors of success/failure
- Records and record keeping

Appendix 4: Regression results.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.893(a)	.798	.792	18.21134

a Predictors: (Constant), Total cultivated area in hectare, Loan seeking from grain bank dummy variable, Number of bags stored by respondents

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	125769.666	3	41923.222	126.407	.000(a)
	Residual	31838.679	96	331.653		
	Total	157608.346	99			

a Predictors: (Constant), Total cultivated area in hectare, Loan seeking from grain bank dummy variable, Number of bags stored by respondents

b Dependent Variable: HSS (bags)

Coefficients (a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-20.436	4.831		-4.231	.000
	Loan seeking from grain bank dummy variable	8.053	4.740	.080	1.699	.093
	Number of bags stored by respondents	2.526	.338	.409	7.473	.000
	Total cultivated area in hectare	1.673	.147	.618	11.391	.000

a Dependent Variable: HSS (bags)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.815(a)	.665	.654	189.19481

a Predictors: (Constant), Total cultivated area in hectare, Loan seeking from grain bank dummy variable, Number of bags stored by respondents

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	6807444.429	3	2269148.143	63.393	.000(a)
	Residual	3436289.001	96	35794.677		
	Total	10243733.430	99			

a Predictors: (Constant), Total cultivated area in hectare, Loan seeking from grain bank dummy variable, Number of bags stored by respondents

b Dependent Variable: (FA)food Adequacy ratio(%)

Coefficients (a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.903	50.185		.058	.954
	Loan seeking from grain bank dummy variable	95.956	49.241	.118	1.949	.054
	Number of bags stored by respondents	32.621	3.511	.655	9.291	.000
	Total cultivated area in hectare	5.878	1.526	.269	3.852	.000

a Dependent Variable: (FA)food Adequacy ratio(%)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.815(a)	.665	.654	140.87527

a Predictors: (Constant), Total cultivated area in hectare, Loan seeking from grain bank dummy variable, Number of bags stored by respondents

ANOVA (b)

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3774289.456	3	1258096.485	63.393	.000(a)
	Residual	1905200.914	96	19845.843		
	Total	5679490.370	99			

a Predictors: (Constant), Total cultivated area in hectare, Loan seeking from grain bank dummy variable, Number of bags stored by respondents

b Dependent Variable: (EA)Energy Adequacy(%)

Coefficients (a)

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.161	37.368		.058	.954
	Loan seeking from grain bank dummy variable	71.449	36.665	.118	1.949	.054
	Number of bags stored by respondents	24.290	2.614	.655	9.291	.000
	Total cultivated area in hectare	4.377	1.136	.269	3.852	.000

a Dependent Variable: (EA)Energy Adequacy(%)

Appendix 5: Cross tabulation results

Food adequacy category * Village of household head Crosstab

Count

		Village of household head				Total
		Ngomai	Chitego	Manchali	Kinangali	
Food adequacy category	< 80 %	4	5	5	9	23
	80% - 100%	0	1	0	2	3
	>100%	26	21	18	9	74
Total		30	27	23	20	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	13.612(a)	6	.034
Likelihood Ratio	13.595	6	.035
Linear-by-Linear Association	7.620	1	.006
N of Valid Cases	100		

a 5 cells (41.7%) have expected count less than 5. The minimum expected count is .60.

Energy adequacy category * Village of household head Crosstab

Count

		Village of household head				Total
		Ngomai	Chitego	Manchali	Kinangali	
Energy adequacy category	< 80 %	4	6	6	11	27
	80% - 100%	0	4	2	4	10
	>100%	26	17	15	5	63
Total		30	27	23	20	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.052(a)	6	.002
Likelihood Ratio	23.749	6	.001
Linear-by-Linear Association	14.314	1	.000
N of Valid Cases	100		

a 4 cells (33.3%) have expected count less than 5. The minimum expected count is 2.00.

HSS category * Village of household head Crosstab

Count

		Village of household head				Total
		Ngomai	Chitego	Manchali	Kinangali	
HSS category	< 3 bags per one adult equivalent	4	10	8	15	37
	> 3 bags per one adult equivalent	26	17	15	5	63
Total		30	27	23	20	100

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	19.647(a)	3	.000
Likelihood Ratio	20.423	3	.000
Linear-by-Linear Association	16.514	1	.000
N of Valid Cases	100		

a 0 cells (.0%) have expected count less than 5. The minimum expected count is 7.40.

Appendix 6: T – test results**Group Statistics**

	Are you a member of GMGB?	N	Mean	Std. Deviation	Std. Error Mean
Number of bags per adult equivalent	yes	50	8.2166	6.70770	.94861
	no	50	6.1674	4.14122	.58566

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	90% Confidence Interval of the Difference	
									Lower	Upper
Number of bags per adult equivalent	Equal variances assumed	.919	.340	1.838	98	.069	2.0492	1.11484	.19796	3.90044
	Equal variances not assumed			1.838	81.615	.070	2.0492	1.11484	.19441	3.90399