

Technical Efficiency of the Rural Savings and Credits Cooperative Societies in Tanzania: A DEA Approach

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Abstract

This study employed Data Envelopment Analysis approach to assess the technical efficiency of rural SACCOS in Tanzania. The study found out that the technical efficiency of SACCOS varies across and within the regions where the efficiency scores for Morogoro, Dodoma and Kilimanjaro regions were 0.61999, 0.6028724 and 0.4649 respectively. We also noted that higher costs of operations for rural SACCOS attributed to low efficiency. Based on the findings of this study, we recommend that rural SACCOS in Tanzania should improve their efficiencies by utilizing savings, deposits and expenses effectively.

Keywords: Technical Efficiency, Rural Savings and Credits Cooperative Societies, DEA, Tanzania.

1.0 Introduction

Cooperative Microfinance model is adapted in most countries in Africa and in the world. African countries replicate Cooperative Financial Institutions (CMFIs) models from America, Europe, Latin America and Asia. Some CMFIs are purely NGOs since they are associated with religious institutions and community development projects. The main objective of cooperative MFIs is to maximise the benefit to their members. The efficiency of CMFIs differs from one continent to another in the world despite main performance features remains the same. The efficiency of cooperatives is relatively better in Europe and North America than Asia and Africa. Goddard *et al*, (2008) revealed that the share of non-interest income in total income for the USA credit unions (CMFIs) had increased significantly between 1993 and 2004 by about 3% and 7% respectively. By the end of 2004, the share of non-interest income for credit unions with assets of more than \$100 million was about three times of the credit unions with assets below \$2 million. Fried *et al* (1993) find that about 20% of productive inefficiency for credit unions in USA. However, this performance is relatively better when you compare with the performance of least developing countries.

In Bangladesh the Grameen Bank (GB) which functions in cooperative model lent \$42 million microloans to the poor to destitute women and maintained a loan recovery rate of over 98% in

2003 (Satgar, 2003). According to Misra (2009), the financial position of some of the District Central Cooperative Banks (DCCBs) in India for the year 1998-2002 has been quite dissatisfactory where their net profits were negative. However, Zamora and Agutaya (2011) find a relatively good performance of cooperatives in Philippines. According to Lapenu and Zeller (2001), the loan repayment performance of MFIs in Latin America, Africa and Asia was 93.1%, 88.7% and 95.6% respectively. Similarly, Rodriguez (2008) reports that one of CMFIs, Mixtlan in Mexico had shown good financial performance and it had a sustainable rate of 35.8% and 22.5% assets growth rate for the three years because of being effective in loans administration and follow-up. In most of African countries the performance of cooperatives is not encouraging. Puret *al*, (n.d) exposes among the 2514 primary cooperatives only 14% of them were found to be active in Nigeria. Chibanda (2009), Seleke and Lekorwe (2010) and Burger (n.d) find unsatisfactory performance of cooperatives in Botswana and Kwazulu-Natal South Africa because of inadequate technical and management skills and dependence of Government subsidies.

According to Wangwe (2004) and Bibi (2006) SACCOS is the dominance source of microfinance working in rural Tanzania. Other institutions offering financial services to rural people are banks, NGOs, large companies financing through contract farming, government and public sector institutions.

The efficiency of cooperatives and SACCOS in Tanzania is influenced by social, economic and political environments based on history. Hakikazi (2006) establishes that Cooperatives have been an important part of the development of Tanzania for 75 years since 1925. During the socialism errors, cooperatives became the main tool for building a spirit of self-reliance. However, after introduction of free markets, cooperatives have struggled to compete with the private sector where many of them failed to survive. The formation of SACCOS in Tanzania was advocated and encouraged by the Government as one way of promoting access to financial services for rural people since 1980s. Even after 1990s when most crop marketing cooperatives collapsed, SACCOS continued to survive (Maghimbi, 2010). Mwakajumulo (2011) reveals that in the period 1994-1996 most of the SACCOS were operating at a loss hence they sustained because of receiving the government subsidy and donor grants. The overdue loans from cooperative unions and SACCOS at the end of June 1991 was Tanzania shillings 6128 million which was 72.61% of the total loans portfolio (1 Usd is equivalent to 1610 Tanzanian shillings). Large amount of loan arrears by SACCOS signify the inefficiencies, since SACCOS depend mostly on the interests from loans to operate. The government of Tanzania endeavors to streamline audits and inspections for SACCOS in order to control embezzlement in cooperatives as well as increasing their efficiencies. The Government of Tanzania struggles to reforms programme to strengthen cooperatives financial services in rural areas. Up to March 2013, the government managed to register 5559 SACCOS with more than 970665 members. The SACCOS also accumulated shares, savings and deposits and loans of Tanzanian shillings 399.0 and 627.2 billion in 2011 respectively (MOFT, 2012; 2013).

2.0 Literature Review

2.1 Empirical literature review on efficiency

Various empirical studies have been done to assess the efficiency Microfinance Institutions (MFIs) in Tanzania, East Africa and various parts of the world. However, most of studies focus the efficiency of banks or MFIs in general. Every study measures individual or combinations of technical, pure, intermediation, scale and allocative efficiency

based on the objectives of the study. According to Kipesha (2013), Gwahula (2012) and Dong and Featherstone (2004); Technical efficiency is the effectiveness with which a given set of inputs is used to produce maximum output. Pure technical efficiency is a measurement of how far off a Decision Making Unit (DMU) is from the production frontier. It measures the proportional reduction in input usage that is achieved if the DMU is operating at constant returns to scale if a DMU adopts the best production and/or management practices. Intermediation efficiency assumes microfinance institutions mobilize funds from surplus to deficit area/to the poor. Scale efficiency is the reduction in unit cost available to a firm when producing at a higher output volume while Allocative efficiency is where the MFI offer types of services that are more desirable and have high demand. The following section illustrates some of the studies done to assess the efficiency of MFIs.

Most of studies applied Non-parametric Approach where Data Envelopment Analysis (DEA) model were used to estimate efficiency of MFIs while few studies applied other methods. The studies which applied other methods include Isler (2010) who used a cost structure to assess efficiency of the Islamic microfinance institutions in Swiss land where he reveals that there is an actual gap in efficiency between conventional and Islamic microfinance institutions due to the different in products offered. Also he reveals that Islamic microfinance institutions generate less income because they incur less cost. Awotide et al (2011) reveals that the cooperative societies were neither efficient in the queue management nor credit delivery. Abayie et al (2011) by using a Cobb-Douglas Stochastic frontier model for the period from 2007-2010 find an overall average economic efficiency of 56.29% of MFIs in Ghana. Masood and Ahmad (2010) measured the determinants of efficiency of microfinance institutions in India by applying stochastic frontier approach for the year 2005-2008 and they find low efficiency of microfinance institutions in India. McKillopet al (n.d) examined the relative efficiency of UK credit unions by radial and non-radial measures of input cost efficiency and associated scale efficiency where they reveal that 37% of credit unions

(CMFIs) in UK under-spend on labour costs (salaries, wages and national insurance) indicating that their performance was relatively efficient. Fried et al (1993) by using parametric and stochastic techniques find about 20% productive inefficiency on average the labor input and other operating expense for the US cooperative unions.

Most of the studies applied Data Envelopment Analysis (DEA) approach and Tobit regression model to evaluate the efficiency of MFIs. We first present the studies done in various locations of the world, then East Africa and Tanzania specifically. Similarly, we discuss studies done to assess efficiency of other microfinance institutions and then SACCOS specifically. González (2008) examined the relative technical efficiency of a sample of microfinance institutions (MFIs) in Mexico and he finds that most MFIs have been more efficient in pursuing sustainability (proxied by the performing loan portfolio size) rather than breadth of outreach (number of clients). Fukuyama et al (1995; 1999) analysed the returns to scale and efficiency of the credits association in Japan and reveal that 70% and 30% of the credit association industry in Japan were operating at decreasing and increasing returns to scale respectively. They also estimated the overall efficiency and productivity growth of credit cooperatives during 1992–1996 where they find that foreign-owned cooperatives (20% of all cooperatives) were more efficient and experienced greater productivity growth in Japan. Deelchand and Padgett (1999) reveal that large cooperative banks were at cost disadvantage compared to small ones in Japan. They classified bank in all, small and large categories. Dong and Featherstone (2004) found out that rural credits cooperatives in Zhejiang, Shandong and Guizhou provinces in China were inefficiency in using loans to generate income. The same results were found by Kipesha (2012) in Tanzania who revealed that Cooperatives MFIs were relatively less efficient compared to NGOs MFIs and banks.

Currently some scholars have shown their interests to study the efficiency of MFIs in the East Africa and Tanzania by using Non-parametric Data Envelopment Analysis (DEA) approach. However, most of studies concentrate on banks' or generalizes

the efficiency of all MFIs. Aikaeli (2008) estimated the technical and scale efficiency for commercial banks in Tanzania. He reveals that though banks were not full efficient in all respects, they performed fairly well during the 1998-2004 period. Kipesha (2012; 2013) assessed MFIs and bank efficiency in East Africa and Tanzania for the 3 years (2009-2011). He finds that the average technical efficiency scores for all MFIs in East Africa was 0.785 and 0.869 under constant return to scale and variable return to scale respectively. He also observed that the pure technical efficiency, intermediation efficiency, average socio efficiency score and the social efficiency inputs scores for the five years (2007-2011) for cooperative banks were 5.56%, 1.39%, 2.57%, 6.63% and 17.75%, 0.4207 under CRS and 0.4651 VRS, 0.2939% 0.3496 CRS and 0.4194 VRS respectively. Moreover, Kipesha (2012; 2013) revealed that most of the MFIs in Tanzania were operating under decreasing return to scale and on average the banks and non bank financial Institutions were more relatively efficient compared to NGOs and Cooperatives also Kenya and Rwanda had higher average efficiency under constant return to scale while Tanzania and Uganda had higher average efficiency scores under variable return to scale. Conversely, Nyamsogoro (2010) finds that member based microfinance institutions are more efficient in reducing costs than NGOs microfinance institutions in Tanzania.

To the best of our knowledge, there are only few empirical studies focusing on the efficiency of Savings and Credits Cooperative Societies (SACCOS) in Africa and Tanzania in particular. Tesfamariam et al (2013) applied the Data Envelopment Analysis (DEA) to evaluate the relative efficiency of rural SACCOS in Tigray region of Ethiopia. They noted that technical efficiency varies across geographical location and scale size of the cooperatives. The results find that the average efficiency for SACCOS was 21.3% and only 5.5% of the SACCOS were relatively efficient with the maximum efficiency score of one. The Technical efficiency was higher for larger than smaller and medium SACCOS. Nyankomo and Aziakpono (2013) used Non-parametric data envelopment analysis (DEA) to measure technical, pure technical and scale efficiency of Saving and Credit

Cooperatives in Tanzania and find that average efficiency scores for technical efficiency, pure technical efficiency and scale efficiency were 42%, 52% and 76% respectively. Also they find that too small firms and very large firms were relatively less efficient compared to medium and large firms where 77% of the firms were operating in an increasing return to scale while 15% and 8% of the firms were operating at constant and decreasing returns to scale respectively. Nyankomo and Aziakpono (2013) suggested that 55% of technical efficiency could be attained if SACCOS use the available resources efficiently.

2.2 Approaches for measuring MFIs efficiency

According to Qayyum and Ahmad (2008) the efficiency can be estimated by econometric or mathematical programming estimation (DEA) where the econometrical method estimates the production or cost /profit functions to define the frontiers. Meeusen and van den Broeck (1977) argue that econometric approach lead to overestimation while the DEA analysis is flexible and accommodates variable returns to scale scores. Berger (1997) asserts that DEA approach can deal with relatively few samples when compared with other parametric approaches, does not require the input prices which are sometimes difficult to obtain and it provide good estimate compared to accounting measures. Porcelli (2009) argues that the econometric approach is parametric and as a result suffers from functional form misspecification; while the programming approach is non-parametric solve the problem of functional misspecification. Masood and Ahmad (2010) contend that stochastic frontier approach for measuring efficiency has advantages over nonparametric approaches because it covers the measurement errors, omitted variables and exogenous shocks in the measurement and it allows the hypotheses testing. However, the main disadvantage of using parametric methods is that they impose functional form on the data and efficiency measurement is highly dependent on true specification of the model. Therefore most of scholars prefer using non-parametric method i.e Data Envelopment Analysis (DEA).

Various scholar use different approaches when using DEA model in estimating the MFIs'

efficiency. The main approaches of DEA are production, assets, and intermediation and value added (Sufian 2011; Qayyum and Ahmad 2008; and Fukuyama1995). Sufian (2011) applied intermediation, operating and value added approaches to examine the benchmarking the efficiency of the Korean banking sector by using a DEA. He considered that a bank is an intermediary between savers and borrowers which conceive total loans and securities as outputs, whereas deposits, labour and capital as inputs for producing loans and investments. Most scholars also consider MFIs as an intermediary mobilizing funds from surplus to deficit area (Kipesha 2012; 2013; Qayyum and Ahmad 2008; Tesfamariam et al 2013etc). Sufian (2011) also applied operating approach where the study considered interest expenses and labour as inputs while interest income and non-interest income from commission, exchange, brokerage were considered as outputs. Under the value-added approach, labour, capital and interest expenses were used as inputs producing outputs of deposits, loans and investments. Kipesha (2012) used production approach with three input variables which are total assets, personnel, operating expenses and two output variables (gross loan portfolio, financial revenue) under both constant return to scale and variable return to scale.

Qayyum and Ahmad (2008) assert that production approach can use deposits and loans as output and the number of employee and capital expenditure as inputs while the intermediation approach use loans and financial investments as output while labour, capital costs and interests payable on deposits as inputs. Also the assets approach use loans as outputs while the credit officers' wage and costs per borrower are used as inputs. Nyankomo and Aziakpono (2013) in evaluating the efficiency of SACCOS in Tanzania defined inputs as labour, capital costs and interest payable on deposits, while the loans, financial investments and value of assets were considered as outputs. They argue that SACCOS struggle to maximize output measured by total loans and other incomes by using the inputs of deposits, labour and capital. Hence they adopted the input orientation and intermediation approach because they argue that SACCOS' managers are more able to control the inputs (personnel, total

assets and total costs) than the outputs (demand for loans, and returns on assets) which are subject to external market forces. Fukuyama (1999) used the asset approach and viewed credit cooperatives as financial intermediaries that transform labor, capital and deposits into loans and security investments. Fukuyama (1999) proxied labour by the number of full-time employees and capital was measured by the asset value of premises, real estate, equipments, suspense payments for unfinished construction, and security deposits and intangibles. Dong and Featherstone (2004) treated deposits as inputs and capital, loans, and deposits to other banks were treated as outputs for the Chinese rural credits cooperatives. This study used total number of members, total savings and deposits and total expenses as inputs while and total loans are considered as output.

2.3 Determinants of MFIs efficiency

According to various scholars, the of MFIs' efficiency can be explained in terms of size of capital, geographical locations, age and model of regulation adopted by MFIs (Majumdar1997; Abayie et al 2011; Kipesha 2012). Abayie et al (2011) noted that age and savings indicators of outreach and productivity and cost per borrower were significant determinants of economic efficiency in Ghana. Masood and Ahmad (2010) reveal that age and geographical location were the positive determinants of microfinance institutions efficiency in India. Also the study finds out that regulated microfinance institutions are less efficient. Conversely, Kipesha (2012) finds the influence of age on bank efficiency in East Africa. Kipesha (2013) finds the positive impact of firm size (measured by total asset and number of borrowers) on MFIs efficiency. Also the study noted that the age of the firms have impacts on the financial revenue but have negative impacts on profitability of the performance of MFIs in Tanzania. Majumdar, (1997) finds that older firms are found to be more productive and less profitable, whereas the larger firms found to be more profitable and less productive in India. Nyamsogoro, (2010) finds that MFIs capital structure, interest rates, difference in lending type, cost per borrower, product type, MFI size, number of borrowers, yield on gross loan portfolio, level of portfolio risk, liquidity level, staff

productivity, and operating model affect efficiency and sustainability of rural MFI (NGOs, SACCOS and SACAS) in Tanzania.

González (2008) finds out that the significant determinants of differences in efficiency are the: average size of loan, proportion of assets used as performing portfolio, percentage of trust funds for the national program to finance microentrepreneurs, scale of operations, ratio of payroll to expenses, age, structure of the board, and for-profit status of the MFI. On the other hand, Krasachat and Chimkul (n.d) find that sizes, types of cooperatives and the level of internal quality control influenced the inefficiency of agricultural cooperatives in Thailand. Tesfamariam et al (2013) find that loans, income and expenses had positive and significant relationship with MFIs efficiency. By using the amount of capital they classified SACCOS into small, medium and large categories. Tesfamariam et al (2013), Dong and Featherstone (2004) and Masood and Ahmad (2010) find the influence of locations on the efficiency of the rural SACCOS and MFIs in Ethiopia, China and India respectively.

2.0 Problem statement and Justification

Most of scholars noted that cooperative MFIs are relatively less efficient compared to others (Tesfamariam et al 2013; Marwa and Aziakpono 2013; Kipesha 2012; Dong and Featherstone 2004). However, to the best of our knowledge, there are few empirical studies which analysed the efficiency of SACCOS in Africa and Tanzania by using DEA approach. Tesfamariam et al (2013) assessed the efficiency of rural SACCOS in Ethiopia while Marwa and Aziakpono (2013) assessed the efficiency of SACCOS in Tanzania. Moreover, Marwa and Aziakpono (2013) assessed the efficiency of both rural and urban SACCOS in Kilimanjaro, Mwanza, Arusha and Dar es Salaam regions. In Tanzania these are big trading centers. Hence the results might not reflect the real situation of all SACCOS in Tanzania including those with small level of business volume. Also Marwa and Aziakpono (2013) combined both urban and rural SACCOS in their analysis and they also analysed the SACCOS' efficiency by using audited data only from the Cooperative Audit and Supervision Corporation (COASCO). It should be noted that

most frequently audited SACCOS are financially and operationally better. Therefore, this study focused the efficiency of SACCOS in rural Tanzania where most of population of Tanzanian (more than 80%) live. This study focused the rural SACCOS in Kilimanjaro regions (as area with high business volume) and Morogoro and Dodoma regions (as areas with low business volume). Hence the influence of the location on the rural SACCOS' efficiency was analysed. Moreover, this study included both audited and unaudited data in analysis so as to have the complete picture of the efficiency of rural SACCOS in Tanzania, since some of the SACCOS are not audited regularly or not audited at all and this might have implications with their efficiency.

3.0 Methodology

This study used Data Envelopment Analysis (DEA) model to examine the efficiency of 37 rural SACCOS from Morogoro, Dodoma and Kilimanjaro regions of Tanzania. The study followed the footprints of Berger (1997) and Farrell (1957) method of measuring efficiency in financial

services. However, the similar model was adopted with adjustments of variables used in measuring in rural SACCOS. The data envelopment analysis model was adopted due to its ability to accommodate multiple inputs and output and the model has its strength of being non stochastic which follow linear programming assumptions. The inputs and outputs chosen are based on the core function of the financial services which is intermediation process. Many rural SACCOS in Tanzania are specialized in intermediation process and hence the method is suitable for the adoption of method. The main source of data is from SACCOS' audited and current financial reports from Dodoma, Kilimanjaro and Morogoro regions. The study used data envelopment analysis as adopted by Berger (1997) in measuring efficiency of the banks, but the model was used here to measure the technical efficiency of rural SACCOS. Initially Charles and cooper was the founder of this model which uses linear programming techniques and it has its strength of having ability to accommodate multiple inputs and outputs. Consider the following equation, which start with the ratio of output to the ratio of inputs:

$$\max h_0 = \frac{\sum_{r=1}^s u_r y_{r0}}{\sum_{i=1}^m v_i x_{i0}}$$

Subject to:

$$\frac{\sum_{r=1}^s u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}} \leq 1; j=1, 2, \dots, n, \quad (1)$$

$u_r, v_i \geq 0; r = 1, 2, \dots, s; i = 1, 2, \dots, m$. Where it is should be noted that x_{ij} is the observed amount of input of the i th type of the j th DMU ($x_{ij} > 0, i = 1, 2, \dots, m, j = 1, 2, \dots, n$) and y_{rj} is the observed amount of output of the r th type for the j th DMU ($y_{rj} > 0, r = 1, 2, \dots, s, j = 1, 2, \dots, n$). In other words, j th DMU uses an m -dimensional input vector to produce an s -dimensional output vector. Here, (x_{i0}, y_{r0}) is the input-output vector of the producer being evaluated. The objective function h_0 tries to maximize the ratio of virtual output to virtual input subject to the constraint that this kind of ratio for each DMU must be less than or equal to unity. The variables u_r and v_i are the weights of output and input which must be non-negative and are determined by the above programming approach. However, a notable problem with this particular fractional formulation is that it has an infinite number of solutions; if (u^*, v^*) is optimal, then $(\alpha u^*, \alpha v^*)$ will also be optimal for non-negative α . Thus Charnes et al. (1978) has transformed the above problem into an equivalent linear programming problem. They

added an additional constraint $\sum_{i=1}^m v_i x_{i0} = 1$ so that the above transformation is achieved and the non-uniqueness problem identified above can be avoided. The notation changes from (u, v) to (μ, v) to reflect the transformation. The new linear programming problem is equivalent to the equations in (1). It can be written:

$$\begin{aligned} \max_{\mu} z_0 &= \sum_{r=1}^s \mu_r y_{r0} \\ \sum_{r=1}^s \mu_r y_{rj} - \sum_{i=1}^m v_i x_{ij} &\leq 0, \quad j = 1, 2, \dots, n \\ \sum_{i=1}^m v_i x_{i0} &= 1 \end{aligned} \tag{2}$$

$$\mu_r, v_i \geq 0; \quad r = 1, 2, \dots, s; \quad i = 1, 2, \dots, m$$

The above equations are known as the multiplier form of the DEA linear programming problem. Because the concept of the duality exists in linear programming, the dual for DMU₀ can be derived as:

$$\begin{aligned} \min_{\lambda} z_0 &= \theta_0^{CCR} \\ \text{Subject to} \\ \sum_{j=1}^n \lambda_j y_{rj} &\geq y_{r0}, \quad r = 1, 2, \dots, s \\ \sum_{j=1}^n \lambda_j x_{ij} &\leq \theta_0^{CCR} x_{i0}, \quad i = 1, 2, \dots, m \end{aligned} \tag{3}$$

$$\lambda_j \geq 0, \quad j = 1, 2, \dots, n$$

The above problem is referred to as the envelopment form of DEA. Optimal solutions (θ, λ) are obtained for each of the DMUs being evaluated. The value of θ is the efficiency score for the particular DMU₀ and this efficiency score is a radial measure of technical efficiency, according to the Debreu-Farrell definition. A set of constraints assures that the value of θ is always less than or equal to unity and the efficiency score for each observed DMU is relative to other DMUs. DMUs for which $\theta = 1$ are identified as the technically efficient while when $\theta < 1$ we have a relatively inefficient DMU. The optimal λ can identify a project (boundary) point located on the constructed production frontier when the problem seeks the radial contraction of the input vector. Inputs and outputs used for this study are classified in Table 1.

Table 1: Classification of inputs and output used

Items	Symbol	Classification
Number of members	X1	Input
Total savings and deposits	X2	Input
Total expenses	X3	Input
Loans issued	Y	Output

4.0 Results

4.1 Descriptive statistics

This study employed a cross sectional sample of 37 observations, where the inputs were total members, total saving and deposits and total expenses while output was the loans paid. Table 2 represents the descriptive results of the study. It should be noted that number of members of SACCOS might influence efficiency because

large number of members means the higher expenses for issuing loans and operation and thus reduction of efficiency. Similar with these findings, Kipesha (2013) found the negative influence of the number workers on efficiency the MFIs in Tanzania. The findings from Table 2 show that the minimum members of rural SACCOS were 40 while the maximum members were 3567. The results portray the mixture of rural SACCOS with small and large number of members respectively. The findings also show that the minimum total expense for rural SACCOS was 0.45 million Tshs while the maximum expense was 117 million Tshs. The results show a variance of incurred expenses among the SACCOS. The efficiency theory contends that, the efficiency of DMU decreases as cost increases. Therefore SACCOS with higher expenses were found to be inefficient. For example the study found that one SACCOS in Kilimanjaro, despite of being profitable, attained low efficient score because incurred high costs of operation. Low efficiency score also might be caused by misallocation of capital. Kipesha (2012) revealed that MFI in Tanzania and East Africa has low efficiency because of misallocation of inputs in the production of outputs. This study revealed that the minimum and maximum amounts of savings and deposits were 0.2 and 8.56 million Tshs respectively. The findings also registered a discrepancy of savings and deposits among rural SACCOS. Principally, the efficiency of rural SACCOS is reduced if loans issued don't match with higher amount of savings and deposits. This occurs when expenses and number of members are also higher. Marwa and Aziakpono (2013) stated that the SACCOS' expenses increases as the SACCOS provide savings and credits services. Therefore, high amount savings and deposits with low amount of loans issued are linked with low efficiency scores. The results from Table 2 show that the minimum and maximum amount of loans issued in 2012 was 3.77 and 843.4 million Tshs respectively. The results also show the diversity of the amounts capital of the rural SACCOS and this might influence their efficiencies. Masood and Ahmad (2010) found large variations efficiency level among Indian MFIs due to large variations of output (i.e) gross loan portfolio.

Table 1: Descriptive presentation of variables

. edit

(5 vars, 37 obs pasted into editor)

summarize		totalmembers		totalsavingsanddeposits		totalexponses	
variable	Obs	Mean	Std. Dev.	Min	Max		
totalmembers	37	550.4595	697.0403	40	3567		
totalsavin~s	37	9.05e+07	1.61e+08	200000	8.56e+08		
totalexpen~s	37	2.31e+07	2.49e+07	450000	1.17e+08		
totalloans~d	37	1.43e+08	1.94e+08	3765000	8.43e+08		

4.2 Correlation of the variables

The results from Table 2 show that total members, savings and deposits and total expenses are positively and significantly corrected with total loans issued. The high correlation of inputs variables with the output indicates that they are crucially significance in explaining the output. The findings show that the higher correlation was between the output (loans) and total expenses, which imply that, the increase in expenses tends to boost the loan paid; it makes sense simply because in SACCOS it is not like the formal financial institutions where the costs are centered this case the follow up costs are associated with the loans repayment. Based on this fact, some rural SACCOS' efficiencies seem to be lower because they incurred high costs of loans' follow-up to enhance loans' repayment. The vice versa is true for SACCOS which were lenient in credits follow-up, where they registered high efficiencies. Therefore scoring of high efficiency by a rural SACCOS cannot be interpreted directly as a sign of good performance without considering other variables which measure the SACCOS' performance such as profitability and owners equity. Therefore it should be noted that efficiency shows how the rural SACCOS used small amount of inputs (number of members, expenses, savings and deposits) to attain the maximum amount of output i.e to issue maximum amount of loans to their members. Thus reduction of loans processing, monitoring and follow-up costs results into higher MFI's efficiency for some rural SACCOS. It is obvious that if SACCOS don't make effort to enhance their repayment of loans, they will close their SACCOS. Therefore

incurring low expenses while embracing high amount of Non Performing Loans (NPL), we don't consider the rural SACCOS as completely efficient. For that reason we recommend that reduction of costs should match with follow-up of NPL. We propose that only costs per borrower and unnecessary costs should be reduced for rural SACCOS to be efficient. Crombrugge et al (2008) suggested that in India the MFIs can reduce the cost of loan per borrower in order to become efficient. Similarly, Krahen and Schmidt, (n.d) affirmed that handling a larger credit portfolio also produces additional costs which have to be covered by a corresponding increase in interest income implying that large credit portfolio might lower rural SACCOS profitability and efficiency. The correlation results of this study are similar with those obtained by Tesfamariam et al (2013) who found out that loans and income (outputs) were 0.80 positively correlated with deposits and expense (inputs) for Ethiopian rural SACCOS.

Table 2: Correlation of variables

	totalmembers	totalsavings	totalexpend	totalloans
totalmembers	1.0000			
totalsavings	0.7458	1.0000		
totalexpend	0.7305	0.6412	1.0000	
totalloans	0.6570	0.6198	0.8165	1.0000

4.3 Efficiency of SACCOS within the regions

Table 3 represents the results of technical efficiencies of individual rural SACCOS in regions where the score of efficiency for Morogoro, Dodoma and Kilimanjaro regions were 0.61999, 0.6028724 and 0.4649 respectively. The average region scores indicate that rural SACCOS in regions were inefficient. The findings show that Morogoro region had higher efficiency than the Dodoma and Kilimanjaro regions. The overall technical efficiency of Morogoro region was 62% indicating 38% of inputs' wastes. These results are in line with Tesfamariam et al (2013) who found out that rural SACCOS in Ethiopia were inefficient where only 5.5% of rural SACCOS in Ethiopia had maximum efficiency score of one. The results of this study are also in tandem with Marwa and Aziakpono (2013) who recorded the technical efficiency of 42% of the overall mixed (rural and urban) Tanzania's SACCOS. As described earlier, efficiency score does not depict the complete situation of the financial performance of the rural SACCOS but explains how the rural SACCOS use the minimum amount of number of borrowers, savings and deposits to issue the maximum amount of loans. Moreover, the efficiency score does not describe whether loans issued were repaid or not. During the study it was found that many SACCOS have large amount of Non Performing Loans (NPL). Hence issuing large amount of loans means also incurring high cost of loans' monitoring and follow-up and hence low inefficiency. The study noted that 17 SACCOS (about 46%) in Morogoro and Dodoma regions were not issuing new loans; some for two years because they had large number of NPL and this affected their operations. However, the situation was different in Kilimanjaro region where all SACCOS were working. The study revealed that only 1 (among 9) SACCOS in Kongwa district i.e Chambasho was active while 9 SACCOS in Morogoro region didn't issue new loans because their members defaulted their loans. The efficiency of Kilimanjaro SACCOS was low because they incurred high costs of operations. For example one SACCOS in Kilimanjaro region incurred operating expenses of 117 million Tanzanian shillings (1 USD is equivalent to 1610 Tshs) and for this reason it was least efficient. The higher cost of operations for Kilimanjaro rural SACCOS also was associated with higher costs of loans' follow-up. Since Kilimanjaro rural SACCOS had low default rate compared to Morogoro and Dodoma SACCOS. The findings show that Mzumbe rural, Tchenzema, Langali, Kikeo and Mkuyuni SACCOS had the highest technical efficiency of 1. Mzumbe rural, Tchenzema and Langali SACCOS had higher efficiency score because they incurred low costs of operation since they stopped to issue the new loans. Also these SACCOS were having large number of NPL. Conversely, Kikeo and Mkuyuni SACCOS were active and were issuing new loans. Hence we can prove that only Kikeo and Mkuyuni SACCOS were exactly efficient because their new loans were included in the calculation of the efficiency scores. In Morogoro region, the Melela SACCOS was least in efficiency because number of members, savings and deposits and expenses were not compatible with the amount of loans issued. These findings are in line with Kipesha (2013) who revealed that most of the

MFIs Tanzania was operating under decreasing return to scale, implying that the increase of input variables was not proportionate with the increase of output variables.

Dodoma ranked the second with the mean efficiency of 60% implying 40% inputs was wasted. Chambasho and Mwangaza SACCOS recorded the higher efficiency score of 1, where the remaining SACCOS were having the scores of less than 1 implying that were having higher inputs wastes. The study noted that Mwangaza SACCOS attained high efficiency score because it incurred low costs of operation and it was not effective in loans follow-up. The study noted that 88% of Mwangaza SACCOS members defaulted their loans and the SACCOS stopped to issue new loans. The study found out that Chambasho was the only SACCOS which was active in Kongwa district. Based on this fact we can conclude that only Chambasho SACCOS was really efficient in Kongwa district. The literature affirms that technical efficiency of MFIs in least developing countries is low but may increase over time if some strategies for improvement are implemented. Masood and Ahmad (2010) found that mean technical efficiency of MFIs in India institutions was quite low (0.34) but it increased over time. Kilimanjaro region SACCOS ranked the least in efficiency among the three regions studied having the mean efficiency of 46% meaning that were having 54% of inputs wastes. The highest score being recorded by Manushi Sinda SACOSS having the score of 1, Umoja and shimbili SACCOS was the only SACCOS which recorded the mean efficiency above 50%, the remaining SACCOS was performing below 50% having higher inputs wastes of more than 50%. The results indicate that SACCOS in Kilimanjaro region incurred higher costs of operations than in Morogoro and Dodoma regions. Likewise their savings and deposits and number of members of SACCOS in Kilimanjaro region didn't match with the amount of loans issued. The finding is consistent with Nyankomo and Aziakpono (2013) who found out that SACCOS in Dar es salaam, Arusha, Kilimanjaro and Mwanza-Tanzania scored technical efficiency of 42% because they incurred higher costs of operation.

Table 3: Efficiency scores of individual SACCOS across and within the regions

NO	DMU	Score		Score		DMU	Score
1	MVUHA_1	MOROGOR	0.38218	20	SAFINA_20	DODOM	0.134612
2	KISAKI_2	MOROGOR	0.27199	21	CHAMBAS	DODOM	1
3	BWAKILA CF	MOROGOR	0.42827	22	MAMI_22	DODOM	0.480043
4	MELELA_4	MOROGOR	0.19571	23	KWO_23	DODOM	0.246259
5	TAWA_5	MOROGOR	0.39555	24	KIFISACC	DODOM	0.800887
6	MTOMBOZI	MOROGOR	0.18944	25	CHAMTUN	DODOM	0.285023
7	BUNDUKI_7	MOROGOR	0.53728	26	MWANGA	DODOM	1
8	MZUMBE RU	MOROGOR	1	27	MUKUKU	DODOM	0.67484
9	KIKEO_9	MOROGOR	1	28	CAVI_28	DODOM	0.804188
10	MLALI_10	MOROGOR	0.62133				
11	MATOMBO	MOROGOR	0.62954				
12	MVOMERO	MOROGOR	0.83341				
13	KIROKA_13	MOROGOR	0.49016				
14	KINOLE_14	MOROGOR	0.47643				
15	TCHENZEMA	MOROGOR	1				
16	LANGALI_16	MOROGOR	1				
17	MKUYUNI_17	MOROGOR	1				
18	WANYAMA	MOROGOR	0.99891				
19	HEMBETI_19	MOROGOR	0.32963				
	average		0.61999	average			0.6028724
						average	0.4649

5.0 Conclusion and recommendations

This study assessed the technical efficiency of rural SACCOS in Tanzania because are the engine for economic growth and development of rural areas. Bwana and Mwakujonga (2013) revealed that in Tanzania SACCOS and other cooperatives contributes about 40% to the Tanzania's GDP and

employs 94.7% of school leavers every year. Therefore their efficiencies will enhance economic development of 80% of Tanzanians living in the rural area. This study found out that the technical efficiency of rural SACCOS varies across and within the regions where the efficiency scores for Morogoro, Dodoma and Kilimanjaro regions were

0.61999, 0.6028724 and 0.4649 respectively. The findings are in tandem with Nyankomo and Aziakpono (2013) and Tesfamariam et al (2013) who noted the inefficiencies of SACCOS in Tanzania and Ethiopia respectively. This study noted that higher costs of operations for rural SACCOS were reasons for low efficiency. Based on the findings of this study, we recommend that rural SACCOS should improve their efficiencies by utilizing savings, deposits and expenses effectively. Our recommendations are in line with Kipesha (2012) who emphasized the evolution of new strategies to increase efficiency of MFIs in Tanzania and East Africa.

6.0 References

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