

# Firm Characteristics and Operational Efficiency of Agricultural Firms Listed at Nairobi Securities Exchange in Kenya

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## Abstract

Operational efficiency has attracted much interest in corporate finance literature over several decades. However, in the context of the agricultural sector, it has received little attention in developing economies such as Kenya. Operational efficiency and performance of Agricultural firms listed at the Nairobi securities Exchange have been fluctuating over the years. This is partly attributed to specific firm characteristics. The objective of this study was to determine the relationship between firm characteristics and operational efficiency of agricultural firms listed at Nairobi securities Exchange. The study was anchored on trade off theory, liquidity preference theory, agency theory, miller and Orr's cash management model. The target population was 7 agricultural companies listed at Nairobi securities exchange. The study used audited financial statements' secondary data collected from 2011 to 2020. Data was analysed using descriptive statistics, correlation analysis and panel data regression analysis with the help of STATA version 13. The study found out that there was a significant negative relationship between asset tangibility, firm size and operational efficiency of agricultural companies listed at Nairobi securities exchange. Further, there is a significant positive relationship between cash reserves and operational efficiency of agricultural firms listed at Nairobi securities exchange. This study recommends that management of agricultural companies listed at Nairobi securities exchange should pay attention on asset tangibility, firm size and cash reserves because they have a significant relationship with operational efficiency. Firms can utilize productive assets as collateral for debt without incurring high borrowing costs. The firm size should be optimal because very large firms are characterised by inefficiencies due to control weaknesses. Policy makers should incorporate factors such as asset tangibility, firm size and cash reserves in their strategic plans.

**Keywords:** Operational efficiency, firm characteristics, firm size, liquidity, asset tangibility and cash reserves.

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## 1. Introduction

Firm characteristics are distinct features of a firm such as ownership structure, capital structure, firm age, firm size, number of employees and liquidity level (Ganguli, 2013). Kogan and Tian (2012) stated that fundamental factors such as turnover, growth in sales and assets, liquidity, leverage and firm size constitute a firm's characteristics. Firm characteristics used in this study were firm size, liquidity, cash reserves and asset tangibility. This study used the log of total assets to measure firm size. Irungu (2019) used the log of total assets as the proxy for firm size. Bhunia (2010) stated that liquidity refers to the firm's ability to pay its short-term financial obligations. Liquidity and operational efficiency are conflicting objectives that firms strive to achieve by diversifying their asset portfolio (Akenga, 2017). This study used the current ratio to measure liquidity.

Asset tangibility is the ratio of tangible assets to total assets or the ratio of property plant and equipment to total assets (Campello & Giambona, 2011; Degryse, de Goeij, & Kappert, 2012). Koksal, Orman and Oduncu (2013) study noted that there is a positive relationship between tangibility and leverage because firms match the maturity of liabilities with the maturity of assets. Cash reserves include short term investments that generate low rates of return such as treasury bills. Firms hold cash reserves to pay for emergencies and other short-term needs. Firms with adequate cash reserves have the necessary liquidity to pay for immediate purchases and invest in potential investments while firms with insufficient cash reserves must borrow to remain afloat (Akenga, 2017). Operational efficiency is a measure of the outputs of a firm's operations and policies in monetary terms (Djiogap & Ngomsi, 2012). Operational efficiency aims at redesigning work processes to improve quality and productivity (Darrab & Khan, 2010). Operational efficiency is the ratio of average outputs to average inputs (Charnes, Cooper, & Rhodes, 1978) as cited by (Wachira, 2018). Economies of production is the basis of assessing productivity and efficiency and it answers fundamental questions such as how efficient is the production process (Wachira, 2018). Efficient firms utilise their resources to generate new capabilities, gain competitive advantage, adopt new technology and improve financial performance (Santa, Ferrer, Bretherton, & Hyland, 2010).

A firm is technically efficient when it attains maximum output with available resources. Input and output ratios are used as performance indicators for measuring operational efficiency (Rao & Lakew, 2012) Different metrics are used to measure operational efficiency such as total asset turnover ratio, fixed assets turnover ratio and equity turnover ratio. These metrics measure the ability of the firm to efficiently manage operational costs and thereby influence its profitability (Rao & Lakew, 2012). This study used total asset turnover ratio to measure operational efficiency.

Nairobi Securities Exchange plays a vital role in Kenya's economic growth and development by promoting savings and investments as well as helping companies to access capital (NSE, 2021). Nairobi Securities Exchange promotes economic development by mobilising savings and reallocating resources from those with excess capital to active agents, by facilitating long term investments, by facilitating privatisation of state corporations, enhancing foreign direct investments and enabling companies to raise new capital for expansion (NSE, 2021). Firms listed in the Agricultural sector at the Nairobi securities exchange are Kakuzi Limited, Sasini Limited, Rea Vipingo Plantations Limited, Williamson Tea Kenya Limited, Eaagads Limited, Limuru Tea company Limited and Kapchorua Tea company Limited (NSE, 2021).

Operational efficiency has attracted much interest in corporate finance literature over several decades. However, in the context of the agricultural sector, it has received little attention in developing economies such as Kenya. Operational efficiency and performance of Agricultural firms listed at the Nairobi securities Exchange have been fluctuating over the years. This is partly attributed to specific firm characteristics. Despite the government effort to revitalize agriculture, firms in this sector have been performing poorly over the years due to operational inefficiencies, adverse weather patterns, poor sales and increase in operating expenses (Waswa, Ndede, & Jagongo, 2014).

When firms are operating efficiently, resources are invested in activities that create more capabilities for the firm (Shawk, 2008). Operational efficiency is a reflection of a firm's competitive advantage (Gill, Singh, Mathur, & Mand, 2014) and firm characteristics such as firm size, liquidity, leverage, cash reserves and asset tangibility have a significant effect on the operational efficiency of a firm. Lotto (2019), examined factors affecting operational efficiency of commercial banks in Tanzania and found a significant positive association between capital adequacy, bank liquidity and operational efficiency. Further, Odunga, Nyangweso and Nkobe (2013) investigated the effect of capital adequacy and liquidity on operating efficiency of commercial banks in Kenya. They found out that capital adequacy, liquidity and the prior year's operational efficiency affects operational efficiency of commercial banks in Kenya significantly.

Kubai (2016) study found that none performing loans have a negative effect on operational efficiency of commercial banks in Kenya while Wanjiru (2018) study found out that the size of a university had a significant negative effect on operational efficiency of public universities in Kenya. The causal nexus between firm characteristics and operational efficiency in the agricultural sector has not received much attention. Existing literature in the global arena has focused more on the operational efficiency in the financial sector, extractive industries, manufacturing, tourism sector and utilities. This study sought to determine the relationship between firm characteristics and operational efficiency of agricultural firms listed at the Nairobi securities exchange in Kenya.

This study is structured as follows: Chapter one provides the background of the study, statement of the problem and the general objective. Chapter two presents relevant theoretical reviews, empirical reviews and the conceptual framework. Chapter three provides details on the research design, target population, empirical modelling and data analysis while chapter four covers the results of data analysis, presentations and discussions. Finally, chapter five provides a summary of findings, conclusion, recommendations and suggested areas of future research.

## **2. Literature Review**

### **2.1 Trade off theory**

Robichek and Myers (1966) proposed the trade-off theory which states that the value of the firm is maximised when the firm's capital structure is optimal. Firms will trade off the cost and benefit of using debt and equity at the optimal level of the capital structure because at this level the cost of using debt is minimum as compared to the accruing benefit of using the mix of debt and equity (Myers, 1977). Capital structure is not static under the dynamic trade off theory and firms allow the leverage ratio to vary depending on the costs and benefit of using debt and equity in the capital structure. The dynamic optimal capital structure is appropriate for firms that require recapitalisation (Fischer, Heinkel, & Zechner, 1989). Firms adjust the capital structure when the leverage ratio touches the boundaries of the of the optimal leverage range. Firm characteristics including bankruptcy costs, interest rate, size and cash flow volatility determine the level of boundaries (Davydenko, 2012).

According to Jensen (1986) shareholders incur agency costs to motivate managers to improve operational efficiency and enhance survival of the firm. Companies incur agency costs due to competing interests between shareholders and creditors, and shareholders and managers (Jensen & Meckling, 1976). Although tax benefits accrue on interest paid on debt, such tax benefits don't arise on dividend pay-outs on equity therefore companies with a high proportion of debt in their capital structure are more valuable due to the tax shield benefit (Titman & Wessels, 1988). This theory states that firms can attain a balance between the interest tax shield benefit, financial distress costs and equity agency costs.

Proponents of trade off theory stated the there is a positive association between leverage and the tangibility of the company's assets. Enterprises that have a large composition of physical assets have a high liquidation value

and thereby low bankruptcy costs. Firms can reduce the cost of borrowing by issuing secured debt (Myers & Majluf, 1984). Trade off theory was relevant in this study because the theory recognises that loan interest is tax deductible and firms benefit by leveraging within the optimal leverage range until they arrive at the optimal capital structure, thereby improving on operational efficiency.

## **2.2 Liquidity preference theory**

Keynes (1936) developed the liquidity preference theory which states that there are three motives for holding cash: transaction motive to bridge the gap between receipts and expenditure, the precautionary motive for holding a pool of buying power to finance unforeseen expenditure and the speculative motive to meet the need to hold money in liquid form when expecting the return on alternative assets to increase thereby cause capital losses. Keynes (1936) stated that, because holding cash is less risky, securities with a long maturity period should generate greater returns because they entail higher risks. The theory further holds that, the profit margin on short-term investment holdings is higher than the expected return for long-term investment holdings because short-term interest rates have a high volatility (Amihud & Mendelson, 1991). People hold money to transact current business and as a store of value (Runde, 1994). People forego interest on money held for transaction and precautionary motives whereas they are willing to hold less cash for these motives when interest rates are high (Runde, 1994).

Interest rates are determined by the forces of demand and supply for liquid cash. Liquidity preference or the need for liquid cash refers to the desire to hold money for transactions motive, precautionary motive and speculative motive. Transaction's motive refers to the desire to hold money to pay for current transactions. Precautionary motive refers the desire to hold money to pay for unforeseen occurrences or contingencies. The speculative motive refers to the desire to hold money in order to take advantage of changes in commodity prices, bond prices and interest rates (Runde, 1994). The speculative demand for money is lower at higher interest rates and, higher at lower interest rates (Taylor & O'Connell, 1985). Liquidity preference theory was relevant for this study because it explains the relationship between liquidity and operational efficiency. Firms listed in the agricultural sector of Nairobi securities exchange may prefer holding cash because it entails lesser risk and can be used to take advantage of changes in commodity prices.

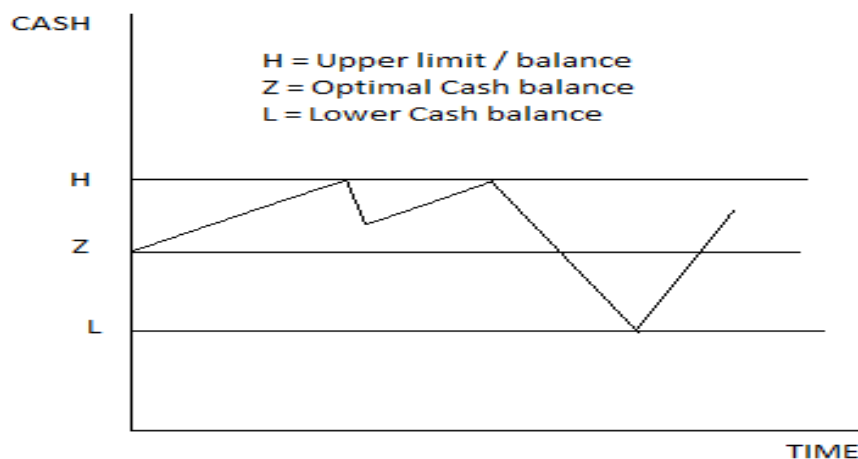
## **2.3 Agency theory**

Jensen and Meckling (1976) developed agency theory. The theory is built on separation of ownership and management and the association between principals and agents. It is built on immediate gains whereby principals delegate the authority to make decisions to their agents who should use resources availed by principals to boost the principal's benefits. Agents may substitute principal's interests with their own thereby commit moral hazards. Principles ensure that agents are acting in the interests of the firms by monitoring their activities. Monitoring costs have an adverse effect on the principal's income because they are expensive (Fama & Jensen, 1983).

When it comes to corporate finance, avoiding agency costs is not easy. It is beneficial for firms to invest using debt instead of paying dividend or repurchasing share using free cash flows. Debt is a disciplinary tool that compels managers to pay dividends instead of pursuing personal interests (Jensen & Meckling, 1976). According to the Jensen model, highly profitable companies with surplus cash flows tend to employ more debt and in profitable projects. Proponents of agency theory stated that there is a direct association between high leverage and efficiency of firms (Muturi, 2019). This theory was relevant in this study because shareholders of agricultural firms listed at Nairobi Securities Exchange expect managers to act in the best interests of the firm when deciding upon the extent of borrowing or raising owners' equity in firm's capital structure. The level of debt should be optimal in order for the firm to maximise shareholders wealth and optimize operational efficiency.

## **2.4 Miller and Orr's cash management model**

Miller and Orr (1966) developed a cash management model whereby firms let the money sitting in their vaults to oscillate within a threshold range. Companies acquire or dispose of marketable securities once the cash balance is at the upper limit or lower limit respectively. This model addressed some of the challenges of the Baumol model by incorporating changing cash flow streams of outflows and inflows. The model was developed to address the problem of random fluctuations in cash inflows and outflows. Proponents of this model stated that a firm's net cash flows has a normal distribution with zero mean and zero standard deviation. According to this model there is a target cash balance (Z) and upper and lower limits of (H) and (L) respectively.



**Figure 2. 1 Cash Management Model**

The model states that firms will allow cash balances to fluctuate between the lower and upper control limits and will not sell or buy marketable securities when the cash balance is between H and L. Marketable securities are bought or sold when cash balances are at the control limit lines. When the cash limit is at H, the firm will purchase treasury bills and other money market instruments to reduce their money holdings to point Z. Similarly, when the cash balance is at L, the firm will sell treasury bills and other money market instruments it is holding to raise the cash balance to level Z. According to this model transaction costs are fixed and the opportunity cost for holding cash is the daily rate of interest for marketable securities. Management should determine the lower limit of cash balance to act as a safety margin, estimate the standard deviation for daily cash flows, and determine the interest rate and transaction costs. This model was relevant for this study because it explains how cash reserves can be used to improve operational efficiency.

## 2.5 Firm Size and Operational Efficiency

Lundvall & Battese (2000) studied the effect of firm size and age on efficiency of Kenyan manufacturing firms in food, wood, textile and metal sectors. The study used a stochastic frontier production function model. Empirical results revealed that firm size had a positive and significant effect on the efficiency of Kenyan manufacturing firms in food, wood, textile and metal sectors.

Cheruiyot (2017) examined the determinants of technical efficiency in the Kenyan Manufacturing sector using the world bank's 2007 enterprise development survey data for Kenya. The study used the two stage non parametric approach and found that the average technical efficiency of Kenya's manufacturing sector was 68.3% and that 63% of the firms operated under increasing returns to scale, 35% under decreasing returns and 2% under constant returns. The tobit estimation results show that size and age of the enterprise affect the efficiency negatively.

Niringiye, Luvanda, and Shitundu (2010) examined the relationship between firm size and technical efficiency in East African Manufacturing firms in East African manufacturing firms. The study employed a two-step methodology by employing DEA approach to calculate technical efficiency measures. First step involves estimating a technical efficiency equation using GLS technique to estimate whether technical efficiency is increasing in firm size. Empirical results indicated that there is a negative relationship between firm size and technical efficiency in both Tanzania and Uganda manufacturing firms.

Pham, Phan, and Takayama (2020) studied production efficiency and firm size distribution among Vietnam firms. The study used two methodologies to study production efficiencies and total factor productivity in manufacturing industries. Empirical results indicate that production efficiencies of middle size firms tend to be lower than those of small size firms or large size firms in most manufacturing industries and that efficiencies of middle size firms are quite diverse. The study found that productivity level across different firms in most industries is diverse. Razmi, Hosseini, and Zolfaqr Arani (2014) sought to examine the effect of firm size on efficiency based on DEA approach. The study used sales to measure firm size and data envelopment analysis as the criteria to evaluate firm efficiency. Empirical results revealed a significant inverse relationship between firm size and efficiency.

## 2.6 Liquidity and Operational Efficiency

Odunga and Nyangweso (2014) examined the effect of credit risk and liquidity on operating efficiency of low and high market share banks in Kenya using the explanatory research design. The study used the fixed effects model to analyse data and found that previous years' operating efficiency and credit risk proxy by loan loss provision to

total equity ratio was significant while liquidity proxy by interbank ratio was not significant in explaining operating efficiency. Previous years operational efficiency, credit risk and liquidity explain 48.6% of the banks operating efficiency. Ikhide (2008) examined the efficiency of commercial banks in Namibia using the standard econometric frontier approach. The study aimed at estimating x-inefficiency for commercial banks in Namibia. Empirical results indicated that substantial economies of scale exist in commercial banking in Namibia implying that by the current scale of operation, commercial banks in Namibia can increase their efficiency.

Adam, Safitr, and Wahyudi (2018) sought to examine the effect of company size, liquidity and operational efficiency on the profitability of commercial banks listed on the Indonesia Securities exchange with problem credit risk as the moderating variable. The study used panel data and found that firm size and operational efficiency had a significant negative effect on profitability. Results showed that there is an interaction between firm size, operational efficiency and credit risk to profitability. Akhter (2018) examined the impact of liquidity and profitability on operational efficiency of selected commercial banks in Bangladesh. The study used panel data and applied different methods in data analysis to generate robust results. Empirical results revealed that liquidity and profitability combined explain 66.23% and 98.85% of the banks operational efficiency using the fixed regression model and panel correlated standard error estimator respectively. The study concluded that while maintaining minimum liquidity, banks can create a profitable loan portfolio by utilizing customer deposits and borrowings and thereby make profits for their shareholders.

Saranga, (2009) analysed the operational efficiency of the Indian auto component industry and its determinants using DEA. The study used publicly available financial data to estimate various efficiency measures using data envelopment analysis. First stage analysis revealed various operational inefficiencies in the auto component industry. Most of the inefficient firms were operating in the diminishing return to scale and exhibited potential savings through benchmark input targets. The objective for the second stage analysis was to explore the root causes of inefficiencies and found that substitution of labour for capital may be causing various inefficiencies. Empirical results implied that higher average inventories are required for higher operational efficiencies in the Indian context. Technology licensing does not have a significant effect on efficiency while management of working capital does not lead to higher operational efficiencies.

Scheraga (2004) examined the structural drivers of operational efficiency and the financial posture of airlines on the eve of September 11<sup>th</sup>. The study used data envelopment analysis to derive efficiency scores for individual airlines then investigated the underlying efficiency drivers. Empirical results revealed that the traditional framework explained relative operational efficiency. The second stage of the analysis found that operational efficiency did not imply superior financial mobility, implying that airlines with efficient operational strategies were vulnerable when it came to financial mobility thereby adversely affected during the period after September 11<sup>th</sup>. Ongore and Kusa (2013) found an insignificant relationship between liquidity and bank profitability. Waswa, Mukras, and Oima (2018) study found an insignificant relationship between liquidity management and firm performance.

## **2.7 Cash reserves and operational efficiency**

Hussien, Alam, and Murad (2008) examined the performance of Islamic banks within the gulf corporation council regarding the 2008 global financial crisis using secondary data from the bank scope data base and international financial statistics. The study found that credit risk, capital adequacy, operational efficiency, financial risk, bank size, liquidity, inflation, money supply growth rate and bank section development had a significant effect on the performance of Islamic banks. The study concluded that although sharia compliant banks performed well during the crisis they were affected by the macroeconomic shocks of the economic crisis.

Chen, Frank, and Wu (2005) examined inventories of publicly traded American Manufacturing companies between 1981 and 2000. Empirical results revealed that there was a reduction in the median inventory period from 96 days to 81 days while the annual mean inventory reduction rate was 2%, work in progress inventory rate was 6% whereas inventories of finished goods did not decline. The study concluded that firms that hold high inventories have very poor long-term return on stock, firms with below average inventories have a better return on stock while firms with low inventories have an average return on stock.

Wanke, Azad, Barros and Hassn (2016) estimated the efficiency of 114 Islamic banks from 24 countries using Technique of Order Preference by Similarity to the ideal Solution (TOPSIS). The study used TOPSIS to assess the efficiency of Islamic banks in a two-stage approach and found that variables related to the country of origin and cost structure have a significant impact on efficiency and that a higher level of competition is beneficial to the Islamic banking market.

Nyangweso, Atambo, and Mogwambo (2019) study found that cash reserves had a significant effect on financial performance. These results also supported (Lozano, 2011) who concluded that cash reserves affect firm value significantly. Firms hold cash reserves to pay for emergencies and other short-term needs.

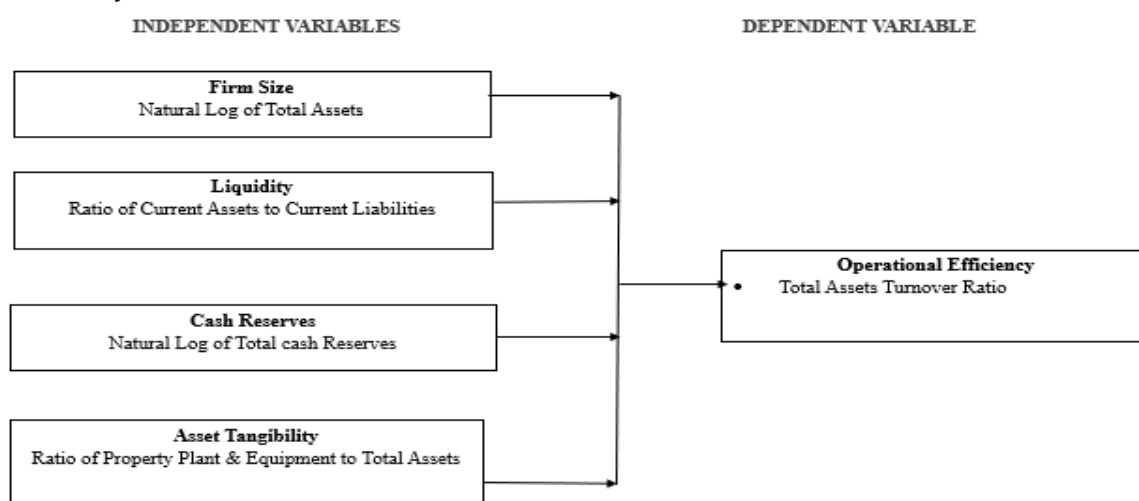
## 2.8 Asset tangibility and operational efficiency

Alberca and Parte (2018) examined operational efficiency of hotels in a dynamic context and analysed efficiency with respect to different frontiers and production technologies depending on the hotel size using data envelopment analysis to examine differences in production technologies. Tobit regression models and boot strap procedure. Empirical results revealed that firm size has a significant effect on operational efficiency in the hotel industry implying that large firms perform better than medium and small sized firms. The study found a link between the efficiency index and financial variables such as cashflow, leverage, bankruptcy and credit ratings and a link with non-financial variables such as type of auditor.

Margaritis and Psillaki (2007) sought to determine the relationship between efficiency and leverage by considering the effect of leverage on firm performance and the reverse causality relationship. The study examined whether high leverage could lead to better performance and whether the effect of efficiency on leverage is significant. For a sample of 12,240 New Zealand firms the study found that there is a positive relationship between efficiency and leverage. The study used the non-parametric data envelopment analysis (DEA) method to construct the frontier. Empirical results revealed that the reverse causality effect of efficiency on leverage is negative at high leverage ratios and positive at low to mid leverage levels. The effect of firm size on leverage positive at mid to high debt ratios and negative at low debt ratios. The effect of intangibles and other assets to leverage is negative while tangibles and profitability have a positive effect on leverage. Alarussi (2021) study found out that asset tangibility has a negative relationship with operational efficiency of listed companies in Malaysia.

## 2.9 Conceptual Framework

A conceptual framework is a hypothetical model depicting the relationship between the dependent and the independent variables (Mugenda & Mugenda, 2003). According to Camp (2001) a conceptual framework aids the researcher in defining the concepts, mapping the conceptual scope, systematising the relationship between concepts and identifying gaps in existing literature. The figure below presents the variables examined by this research study.



## 2.10 Research Methodology

This study used the descriptive research design. Descriptive research design involves observing and describing the behaviour of a subject without influencing it in any way. Many scientific disciplines, especially social sciences use this design to obtain a general overview of the subject. Descriptive research design allows the use of multiple variables in data analysis. The study targeted 7 agricultural firms listed on Nairobi securities exchange and sought to examine the association between firm characteristics and operational efficiency of firms listed under the agricultural sector of Nairobi securities exchange. This study covered the entire population by applying the census technique. Kothari (2004) stated that a census enables the researcher to include every member of the population in the study.

The study collected secondary data from the audited financial statements over a period of 10 years yielding a panel data set. The study collected data on: total assets, current assets, current liabilities, total debt, total reserves, property plant and equipment, net sales and equity for a period of 10 years (2011-2020). Data was analysed using panel data regression, correlation analysis and descriptive statistics. Hausman test was used to identify the appropriate model for the study by selecting between the fixed effects model and the random effects model. Observations in a panel data set varies cross-sectionally and over time (Hsiao, 2007). Panel data sets can estimate effects that cannot be detected in pure cross-sectional or pure time series data (Baltagi, Bratberg, & Holmås, 2005).

Panel data regression model was specified as follows:

$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \varepsilon_i + \varepsilon_{it}$  Where:  $Y$  = Dependent variable (Operational efficiency),  $\beta_0$  = Constant term,  $\beta_1, \beta_2, \beta_3, \beta_4$  = coefficients of independent variables (Firm size, Liquidity, cash reserves and tangibility),  $X_1$  = Firm Size,  $X_2$  = Liquidity,  $X_3$  = Cash Reserves,  $X_4$  = Tangibility,  $\varepsilon_i$  = decomposed individual error term,  $\varepsilon_{it}$  = random error term,  $i$  = individual: 1, 2, 3.....N,  $t$  = time index: 1, 2, 3...T

### 3. Results and discussions

#### 3.1 Diagnostic Tests

This study performed diagnostic tests to check for the validity of the model and to provide guidance for further stages of the regression analysis. The study performed panel unit root test, normality test, multicollinearity test, heteroscedasticity test and autocorrelation test. The outputs of the diagnostic tests are presented in the appendix. The output of the variance inflation factors indicated that none of the variables has a VIF > 10 and the mean VIF is 3.52. We therefore we fail to reject the null hypothesis and conclude that there is no multi-collinearity. The results for the Housman tests indicated that P – value = 0.8006 which is greater than 0.05. The study failed to reject the null hypothesis and adopted the random effects model.

The results of the Breusch Pagan Cook-Weisberg test for heteroscedasticity indicate that the error terms are homoscedastic given that the p-value was greater than 0.05. Based on these results of the Wooldridge test for autocorrelation in panel data the study rejected the null hypothesis because the p – value (p-value = 0.005 for total asset turnover ratio and p-value = 0.0027 for equity turnover ratio) was less than 0.05 and concluded that there is first order serial correlation.

#### 3.2 Regression Analysis

The study regressed firm characteristics (firm size, liquidity, cash reserves and asset tangibility) on the total asset turnover ratio using the XTPCSE command because **the panel data set used by this study had first order serial correlation**. The Appendix presents the output of the regression analysis. The regression analysis model was fitted as follows:

$$Y = 0.957565 - 0.0771864X_1 + 0.001394X_2 + 0.0634844X_3 - 0.2898687X_4$$

Where:  $Y$  = Total Asset Turnover Ratio,  $X_1$  = Firm size,  $X_2$  = Liquidity,  $X_3$  = Cash Reserves and  $X_4$  = Tangibility.

The coefficient of determination, R-squared was 0.3189. This implies that 31.89% of the variation in the operational efficiency of the listed Agricultural firms in Kenya is explained by the variation in firm size, liquidity, cash reserves, and asset tangibility.

The constant term (0.9576) was positive and significant since it had a p – value of 0.006 which is less than 0.05. The results revealed that there was a negative significant relationship between firm size and total asset turnover ratio ( $\beta = -0.077$ ,  $p = 0.033$ ). The calculated z statistic of 2.13 which was high compared to the critical z statistic value of 1.645 supported these results. There was a positive insignificant relationship between liquidity and total asset turnover ratio ( $\beta = 0.001384$ ,  $p = 0.872$ ). The calculated z statistic of 0.16 that was less compared to the critical z statistic value of 1.645 supported this observation. There was a positive significant relationship between cash reserves and total asset turnover ratio ( $\beta = 0.0634844$ ,  $p = 0.000$ ). The calculated z statistic of 3.87 which was greater than the z critical of 1.645 supported this finding. Lastly there was a negative significant relationship between asset tangibility and total asset turnover ratio ( $\beta = -0.2898687$ ,  $p = 0.029$ ). The calculated z statistic of 2.18 which was greater compared to the critical z statistic value of 1.645 supported this observation.

#### 3.3 Hypothesis tests

This study tested the statistical significance of the four firm characteristics in the model at 5% level of significance. The p – values of the coefficients of the firm characteristics were used to test the following null hypotheses:

***H<sub>01</sub>: There is no significant relationship between firm size and operational efficiency of agricultural firms listed at Nairobi securities Exchange.***

After testing the null hypothesis, it was observed that there was a negative significant relationship between firm size and total asset turnover ratio ( $\beta = -0.0771864$ , P-value = 0.033). The study rejected the null hypothesis and concluded that there is a significant negative relationship between firm size and operational efficiency of agricultural companies listed at Nairobi securities exchange. This is consistent with the findings of Aggrey, Eliab and Joseph (2010) study on the relationship between firm size and technical efficiency in East Africa manufacturing firms. The results showed a negative association between firm size and technical efficiency in both Ugandan and Tanzanian manufacturing firms. The results are also consistent with the findings of Biggs, Shah and Srivastava (1996) study on Technological capabilities and learning in African enterprises.

The results of this study implies that smaller listed agricultural firms in Kenya tend to be more efficient than large listed firms. It is possible that small listed agricultural firms in Kenya have flexible and simple organizational structures and decision-making processes which make them more efficient than large listed agricultural firms in

Kenya. Further, the results can be attributed to the fact that large farms are less efficient because of rigid hierarchical structures and due to suffering from the agency problem.

***H<sub>02</sub>: There is no significant relationship between liquidity and operational efficiency of agricultural firms listed at Nairobi securities Exchange.***

After testing the null hypothesis, it was observed that there is a positive and insignificant relationship between liquidity and total asset turnover ratio ( $\beta = 0.001384$ , P-value = 0.872). The study failed to reject the null hypothesis and we conclude that there is no significant relationship between liquidity and operational efficiency of agricultural companies listed at Nairobi securities exchange. These findings concur with that of Ongore and Kusa (2013) who found an insignificant relationship between liquidity and bank profitability. These findings also agreed with that of Waswa, Mukras, and Oima (2018) whose study found insignificant relationship between liquidity management and firm performance. Since there is no significant relationship, the results are not conclusive on the relationship between liquidity and operational efficiency of agricultural firms listed at Nairobi securities Exchange.

***H<sub>03</sub>: There is no significant relationship between cash reserves and operational efficiency of agricultural firms listed at Nairobi securities Exchange.***

After testing the null hypothesis, it was observed that there is a positive significant relationship between cash reserves and total asset turnover ratio ( $\beta = 0.0634844$ , P-value = 0.000). The study rejected the null hypothesis and concluded that there is a significant positive relationship between cash reserves and operational efficiency of agricultural companies listed at Nairobi securities exchange. These findings agreed with Nyangweso, Atambo, and Mogwambo (2019) whose study found that cash reserves had a significant effect on financial performance. These results also supported (Lozano, 2011) who concluded that cash reserves affect firm value significantly. Firms hold cash reserves to pay for emergencies and other short-term needs.

Firms with adequate cash reserves have the necessary liquidity to pay for immediate purchases and invest in potential investments while firms with insufficient cash reserves must borrow to remain afloat (Akenga, 2017). The results of the study imply that listed Agricultural firms in Kenya place a significant emphasis on having sufficient reserves to pay for emergencies, other short-term needs and invest in short term securities.

***H<sub>04</sub>: There is no significant relationship between asset tangibility and operational efficiency of agricultural firms listed at Nairobi securities Exchange.***

After testing the null hypothesis, it was observed that there is a negative significant relationship between asset tangibility and total asset turnover ratio ( $\beta = -0.2898687$ , P-value = 0.029). The study rejected the null hypothesis and concluded that there is a significant negative relationship between asset tangibility and operational efficiency of agricultural companies listed at Nairobi securities exchange. These findings agreed with that of Alarussi (2021) study which found out that asset tangibility has a negative relationship with operational efficiency of listed companies in Malaysia.

#### **4. Summary of findings, Conclusions and recommendations**

The relationship between firm characteristics and operational efficiency in the financial sector, extractive industries, manufacturing, tourism sector and utilities has been thoroughly documented in existing literature globally. However, there is limited research on the relationship between firm characteristics and operational efficiency of agricultural companies listed on stock markets in developing countries. Determining the relationship between firm characteristics and operational efficiency of agricultural companies listed at the Nairobi securities exchange is a move towards contributing to literature on the effect of firm characteristics on the operational efficiency of listed agricultural companies in developing countries. The study hypothesized that there is no relationship between firm size, liquidity, cash reserves and asset tangibility, and operational efficiency of agricultural companies listed at the Nairobi securities. Using panel data regression analysis, the null hypotheses for firm size, cash reserves and tangibility was rejected and it was concluded that there is a significant relationship between firm size, cash reserves and tangibility, and operational efficiency of agricultural companies listed at the Nairobi securities exchange.

##### **4.1 Relationship between firm size and operational efficiency**

There is a significant negative relationship between firm size and operational efficiency. Firm size can influence the firm's operational efficiency because small firms can be more efficient because they have flexible non-hierarchical structures and may have fewer agency problems compared to large firms.

##### **4.2 Relationship between cash reserves and operational efficiency**

There is a significant positive association between cash reserves and operational efficiency. Cash is the most liquid asset because of its portability and acceptability. Firms need liquid assets that can be converted into cash easily when need arises. Firms should have access to an adequate supply of cash. Firms can finance their investments using cash reserves when they cannot access external finance. Cash reserves enables firms to address emergencies and meet their obligations when earnings are low. Firms with an adequate supply of cash reserves have the



necessary liquidity to pay for immediate purchases and invest in potential investments while firms with insufficient cash reserves must borrow to remain afloat.

#### **4.3 Relationship between asset tangibility and operational efficiency**

There is a significant negative relationship between asset tangibility and operational efficiency. Asset tangibility is the ratio of property plant and equipment to total assets. Managers of competitive firms' mix tangible and intangible assets effectively and efficiently. According to trade of theory there is a positive relationship between asset tangibility and leverage. Tangible assets can be collateralised easily and they suffer minimal loss of value when firms are faced by financial distress. Firms with a large proportion of tangible assets have a high liquidation value because tangible assets constitute collateral for loans in the event of bankruptcy. Managers of solvent firms can enhance the value of the firm by allocating assets to better uses. Tangible assets are the cheapest source of funds for firms that are in financial distress. Sale of assets enables a firm to finance the operation of remaining assets without acquiring external debt.

#### **5. Conclusion**

In this study panel data regression analysis was used to explain the relationship between firm characteristics and operational efficiency of agricultural companies listed at the Nairobi securities exchange. The results of the hypotheses tests lead to the conclusion that there is a significant relationship between firm size, cash reserves, asset tangibility and operational efficiency while there is an insignificant relationship between liquidity and operational efficiency of agricultural companies listed at the Nairobi securities exchange.

#### **Recommendations**

This study recommends that management of agricultural companies listed at Nairobi securities exchange should pay attention on asset tangibility, firm size and cash reserves because they have a significant relationship with operational efficiency. The mix of tangible and intangible assets should be effective and efficient. Managers should ensure that the firms property plant and equipment is in working condition. Managers of solvent firms can enhance the value of the firm by ensuring that assets are fully employed. Managers should carefully utilize the fixed assets component of their total assets in order to positively impact the firm's operational efficiency. Firms can utilize productive assets as collateral for debt without incurring high borrowing costs. The firm size should be optimal because very large firms are characterised by inefficiencies due to control weaknesses.

#### **Areas for Further Research**

This study will act as a reference point for future studies on the relationship between firm characteristics and operational efficiency of agricultural companies listed at the Nairobi securities exchange. Based on the results obtained, suggested areas for further research include the following: Using the same methodology further research can be extended to other companies in Kenya and compare results to those of the present study. Further research can incorporate moderating variables and other firm characteristics such as firm age, number of employees, growth, profitability, acid test ratio and cash ratio. Other studies should include other firm level characteristics such as firm age, number of employees, log of market capitalisation, unique technology, growth and profitability that may affect operational efficiency.

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## Appendix

### Skewness And Kurtosis Test For Normality

| Variable      | Obs | Pr(Skewness) | Pr(Kurtosis) | ----- joint ----- |           |
|---------------|-----|--------------|--------------|-------------------|-----------|
|               |     |              |              | adj chi2(2)       | Prob>chi2 |
| TOTALASSET~O  | 70  | 0.1359       | 0.8847       | 2.33              | 0.3117    |
| EQUITYTURN~O  | 70  | 0.1154       | 0.7601       | 2.67              | 0.2625    |
| Log FIRMSIZE  | 70  | 0.0703       | 0.0121       | 8.37              | 0.0152    |
| LIQUIDITY     | 70  | 0.3582       | 0.1780       | 2.77              | 0.2509    |
| Log CASHRES~S | 70  | 0.0079       | 0.1765       | 7.87              | 0.0195    |
| ASSETTANGI~Y  | 70  | 0.5765       | 0.6706       | 0.50              | 0.7781    |

### Unit Root Test

| Variable name              | Adjusted Statistic | P - Value | Comment        |
|----------------------------|--------------------|-----------|----------------|
| Total Asset Turnover Ratio | -7.6306            | 0.0000    | Stationary     |
| Equity Turnover Ratio      | -5.3992            | 0.0000    | Stationary     |
| Log Firm Size              | -1.0748            | 0.1412    | Non Stationary |
| Liquidity                  | -4.4288            | 0.0000    | Stationary     |
| Log Cash Reserves          | -3.0320            | 0.0012    | Stationary     |
| Asset Tangibility          | -2.3546            | 0.0093    | Stationary     |

### Correlation Analysis

|                  | Log FIRMSIZE | LIQUIDITY | Log CASHRESERVES | ASSETTANGILITY |
|------------------|--------------|-----------|------------------|----------------|
| Log FIRMSIZE     | 1.0000       |           |                  |                |
| LIQUIDITY        | 0.1066       | 1.0000    |                  |                |
|                  | 0.3798       |           |                  |                |
| Log CASHRESERVES | 0.8713*      | -0.0100   | 1.0000           |                |
|                  | 0.0000       | 0.9343    |                  |                |
| ASSETTANGIBILITY | 0.3504*      | -0.0674   | 0.0945           | 1.0000         |
|                  | 0.0029       | 0.5793    | 0.4366           |                |

### Variance Inflation Factors

| Variable         | VIF  | 1 / VIF  |
|------------------|------|----------|
| Log FIRMSIZE     | 6.18 | 0.161938 |
| Log CASHRESERVES | 5.42 | 0.184402 |
| ASSETTANGIBILITY | 1.45 | 0.690884 |
| LIQUIDITY        | 1.04 | 0.957544 |
| MEAN VIF         | 3.52 |          |

### Hausman Test For Total Asset Turnover Ratio

|                   | (b)       | (B)       | (b - B)    | sqrt(diag (V_b - V_B)) |
|-------------------|-----------|-----------|------------|------------------------|
|                   | Fixed     | Random    | Difference | S.E                    |
| Log FIRMSIZE      | -.1199502 | -.0880746 | -.0318756  | .0342625               |
| LIQUIDITY         | -.0026448 | -.0035366 | .0008918   | .0014627               |
| Log CASHRESERVES  | .0341561  | .0360862  | -.0019301  | .0038909               |
| ASSET TANGIBILITY | -.1091042 | -.125571  | .0164668   | .0168358               |
| chi2(4)           | 1.65      |           |            |                        |
| Prob>chi2         | 0.8006    |           |            |                        |

### Hausman Test For Equity Turnover Ratio

|                  | (b)       | (B)       | (b – B)    | sqrt(diag(V_b-V_B)) |
|------------------|-----------|-----------|------------|---------------------|
|                  | Fixed     | Random    | Difference | S.E.                |
| Log FIRMSIZE     | -.2037237 | -.1520508 | -.0516729  | .0453567            |
| LIQUIDITY        | -.0138483 | -.015482  | .001634    | .0018943            |
| Log CASHRESERVES | .0438783  | .0460799  | -.0022016  | .0049959            |
| ASSETTANGIBILITY | -.132324  | -.1565446 | .0242206   | .0216276            |
| chi2(4)          | 2.04      |           |            |                     |
| Prob>chi2        | 0.7280    |           |            |                     |

### Heteroskedasticity Test Results

| Breusch-Pagan / Cook-Weisberg test for heteroskedasticity |   |                            |                       |
|---|---|----------------------------|-----------------------|
| Ho: Constant variance                                     |   |                            |                       |
| Variables: fitted values                                  |   | TOTAL ASSET TURNOVER RATIO | EQUITY TURNOVER RATIO |
| chi2(1)   | = | 1.94                       | 0.88                  |
| Prob > chi2   | = | 0.1633                     | 0.3488                |

### Serial Correlation Tests

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

$$F(1, 6) = 46.804$$

$$\text{Prob} > F = 0.0005$$

Wooldridge test for autocorrelation in panel data

H0: no first-order autocorrelation

$$F(1, 6) = 24.130$$

$$\text{Prob} > F = 0.0027$$

### Regression On Total Asset Turnover Ratio

| TOTAL ASSET TURNOVER RATIO | Coef.     | Std. Err. | z     | P> z  | [95% Conf. Interval] |
|----------------------------|-----------|-----------|-------|-------|----------------------|
| Log FIRMSIZE               | -.0771864 | .036159   | -2.13 | 0.033 | -.1480567 - .0063161 |
| LIQUIDITY                  | .001384   | .0085574  | 0.16  | 0.872 | -.0153882 .0181562   |
| Log CASHRESERVES           | .0634844  | .0163984  | 3.87  | 0.000 | .031344 .0956247     |
| ASSETTANGIBILITY           | -.2898687 | .1326986  | -2.18 | 0.029 | -.5499531 -.0297842  |
| _cons                      | .957565   | .3507057  | 2.73  | 0.006 | .2701943 1.644936    |
| R-squared                  | 0.3189    |           |       |       |                      |
| Wald chi2(4)               | 59.72     |           |       |       |                      |
| Prob > chi2                | 0.0000    |           |       |       |                      |

### REGRESSION ON EQUITY TURNOVER RATIO

| EQUITY TURNOVER RATIO | Coef.     | Std. Err. | z     | P> z  | [95% Conf. Interval] |
|-----------------------|-----------|-----------|-------|-------|----------------------|
| Log FIRMSIZE          | -.1195466 | .0464917  | -2.57 | 0.010 | -.2106686 -.0284245  |
| LIQUIDITY             | -.0153057 | .0120192  | -1.27 | 0.203 | -.0388628 .0082514   |
| Log CASHRESERVES      | .0851746  | .0216151  | 3.94  | 0.000 | .0428097 .1275396    |
| ASSETTANGIBILITY      | -.385059  | .1799366  | -2.14 | 0.032 | -.7377282 -.0323898  |
| _cons                 | 1.582424  | .4387039  | 3.61  | 0.000 | .7225799 2.442268    |
| R-squared             | 0.2803    |           |       |       |                      |
| Wald chi2(4)          | 52.17     |           |       |       |                      |
| Prob > chi2           | 0.0000    |           |       |       |                      |