

# **ADOPTION OF GREEN ENERGY AND PERFORMANCE OF BUTALI SUGAR COMPANY IN KAKAMEGA COUNTY, KENYA**

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## **ABSTRACT**

There is increased number of sugar companies that have failed despite advance increase in strategic management best practice. Several studies on organisational performance have revealed that in Kenya, performance is nonlinear despite numerous initiatives. A few studies have tried to account for the mixed performance especially in the context of cost cutting approach in understanding the effect of adoption of green energy on performance. Successful green practices helps firms to achieve greater efficiency, establish and strengthen their core competencies, enhance their green image, all of these may eventually combine to contribute to firm profitability. Environmental sustainability in any given production is very important. The low adoption of green energy has led to high charges on electric units especially during low rainy seasons, and high prices of petroleum and electricity in operations of the company which accounts for poor performance that has necessitated closure of many sugar companies. The study sought to bridge the gap by establishing the effect of green energy adoption on the performance of Butali Sugar Company in Kakamega County, Kenya. The specific objectives were to establish the effect of pollution reduction, cost of production, organizational policy and organizational capacity on the performance of Butali Sugar Company in Kakamega County, Kenya. The study was anchored on three theories which include green economic theory, resourced based view theory and the Innovation Diffusion theory. The study used descriptive research design. The target population was 204 respondents. The

sample size was 134 which was developed using Yamane's formula. A semi-structured questionnaire was used. After data collection, data will be edited, referenced coded to facilitate statistical analysis. Data collected was analyzed using both qualitative and quantitative methods. Data was analyzed using Statistical Package for Social Sciences (SPSS version 21). The data was analyzed using both descriptive and inferential statistics and presented using tables, charts, frequencies, percentages and graphs. The study established that green energy adoption had a positive and significant effect on the performance of Butali Sugar Company. It was concluded that the firm had significantly reduced emissions to the atmosphere by adopting green energy, enhanced use of renewable energy, improved environmental conservation, recycles wastes, embraces environmental friendly waste disposal and collaborates with other firms on waste management. It was further concluded that green energy adoption had significantly reduced the cost of production in the firm despite their being inadequate finances for the project, cost of transportation being slightly higher and the price of license to produce power being moderately higher. The study concluded that the firm has a clear policy guideline on green energy adoption, complies with government policy and regulations governing the project. The study recommends that the management of the Butali Sugar Company Limited should ensure that the production of green energy is maximized to economically viable levels to improve firm returns. The firm also needs to enhance human resource, technological and infrastructure capacity to

facilitate the green energy adoption process and effectiveness.

**Key Words:** *green energy, performance, Butali Sugar Company, Kakamega County, Kenya*

## **INTRODUCTION**

Research has shown that through proactive environmental management and strategies, firms can achieve positive economic performance outcomes (Aragon-Correa & Sharma, 2003). More specifically, acting in an environmentally sustainable fashion provides an opportunity for firms to create value by enhancing revenues and/or reduce costs (Ambec & Lanoie, 2008). Through targeted environmental actions and initiatives, firms can create demand for new, environmentally friendly products which can open up new markets leading to enhanced revenues. Firms can also achieve substantial reputational benefits from environmental action which in turn can lead to increased sales and thus enhance revenues (Dowell, et al., 2000).

On the cost side of the equation, environmental initiatives can help firms to reduce costs through waste and pollution reduction, improved energy efficiency, and improved business processes throughout their operations and supply chains (Rao & Holt, 2005). Moreover, from a long-term perspective, such initiatives can help to avoid potential future costs related to compliance, environmental crisis, and liabilities (Lott, & Wehrly, 2005).

Firms, however, cannot delay new practice adoption for too long because over time institutional pressure increases on firms that have not yet adopted the common practices and such firms become increasingly pressured to do so. Thus, late adopters often adopt a dominant practice because other organizations have already done so and as a way to achieve legitimacy within the organizational field. Late practice adoption is, therefore, frequently viewed as a symbolic rather than substantive action that delivers few performance benefits (Naveh, et al., 2004).

According to Botha (2006) green energy is a subset of renewable energy and represents those renewable energy resources and technologies that provide the highest environmental benefit. Green energy is electricity produced from solar, wind, geothermal, biogas, eligible biomass, and low-impact small hydroelectric sources. It can also be defined as an alternative power that comes from natural sources such as sunlight, wind, rain, tides, plants, algae and geothermal heat (Hugo, 2010). Green energy is also defined as power that comes from resources, which are renewable or naturally replenished (Leibbrandt, 2010). In this study, from the outlined definitions, the right definition of green energy could be as follows: the power generated from bagasse (the fibrous remains after sugarcane or sorghum stalks are crushed to extract their juice).

Globally, green energy is highly produced in different countries. In terms of ranking of countries generating green energy, United states (77,660 gwh), China (63,729 gwh), Germany (57,379 gwh), Japan (41,460 gwh) are highly ranked. Regionally, Brazil produces the highest amount of green energy at the national grid, with a measure of about 48,802 gwh; followed by India at 26,542 gwh, then Thailand at 7,731 gwh. Other countries are still below the 5000 gwh. In Africa, Mauritius was recorded to have produced about 530 gwh, which is the highest in African countries, followed by

South Africa at 310 gwh, Cameron at 103 gwh, then Senegal at 66 gwh and other countries being below the 100 gwh.

In the United States, sugar mills take advantage of bagasse for power, making improvements to their plants to enable the enter process more efficient through project management. Mackay Sugar in Australia has constructed a \$120 million cogeneration power plant in Racecourse Mill in Queensland that can provide 1/3 of the Mackay city region's electricity requirements. The project uses efficient technologies such as high-pressure boiler and a new steam turbine generator, capable of generating 36 megawatts (MW), exporting 27 MW to the national grid. In the United States, the Florida Crystals, uses bagasse to power its sugar mills, in the New Hope Power Co. biomass cogeneration plant. The project is the largest in North America, and accounts for 800,000 tons of sugarcane bagasse and 700,000 tons of wood waste per year. About 8.8 tons of sugarcane required at each plant per day, about one-third will consist of bagasse that will be converted into power.

In Africa, only few sectors can generate production of green energy. One of the main producers of green energy is the sugar milling industry. In Africa, sugar cane is grown for commercial purposes. The sugar milling industry is one of the largest industries in several African countries, as it is the case of Swaziland in South of Africa (Deepchand, 2010). It is one of the plants having the highest bioconversion efficiency of capture of sunlight through photosynthesis and is able to fix around 55 tonnes of dry matter per hectare of land under this crop on annually renewable basis.

Several countries have implemented energy conservation and efficiency measures to minimize co-generated energy utilized in cane processing and to export excess electricity to the grid. In Mauritius 10 out of 11 factories export electricity to the grid during crop season (725 GWh including 318 GWh from bagasse) accounts for 40% of the total generated (Lichts, 2014).

In Kenya, there are limited renewable energy resources and no certainty in oil, gas or coal reserves. Meaning that the current genesis of oil exploration which was flagged of in Turkana to be refined in Mombasa and then used in local sectors is still not determined as a finished product by the oil refineries and the government of Kenya. Hydropower is thus the main locally available energy resources, followed by geothermal energy and the recent development of wind milling. Sugar cane biomass (bagasse and cane tops and leaves) (Belward et al., 2011). Hydropower is almost fully exploited. But other forms of green energy have not been fully explored (Ministry of Energy, GOK, 2012).

Bagasse represents 30% on cane can be used to meet internal power requirement for cane processing. Hydro power and power exported to the grid from sugar factories amounted to 22% and 13% of power supply to the public grid. This contribution is not linked to the sugar-milling sector in Kenya, with a large margin of these sectors making adequate energy if presently conducted on the use of bagasse (Wanjiru & Ochieng, 2013). An increase in fossil fuel import could be prevented by a more efficient exploitation of bagasse energy for electricity generation, which has been less exploited in most sugar milling projects in Kakamega County.

Sustainable economic growth is also threatened by Kenya's vulnerability to climate change. It is estimated that 42% of Kenya's GDP and 70% of overall employment is derived from natural

resource related sectors, including agriculture, mining, forestry, fishing, tourism, water supply and energy. This study therefore sought to establish the effect of green energy adoption on the performance of Butali Sugar Company Limited.

## **STATEMENT OF THE PROBLEM**

There is increased number of sugar companies that have failed despite advance increase in strategic management best practice. Several studies on organisational performance have revealed that in Kenya, performance is nonlinear despite numerous initiatives. A few studies have tried to account for the mixed performance especially in the context of cost cutting approach in understanding the effect of adoption of green energy on performance. Successful green practices helps firms to achieve greater efficiency, establish and strengthen their core competencies, enhance their green image, all of these may eventually combine to contribute to firm profitability. Environmental sustainability in any given production is very important. The low adoption of green energy has led to high charges on electric units especially during low rainy seasons, and high prices of petroleum and electricity in operations of the company which accounts for poor performance that has necessitated closure of many sugar companies. The study seeks to bridge the gap by establishing the effect of green energy adoption on the performance of Butali Sugar Company in Kakamega County, Kenya. Past related studies reveal that; Menzel et al. (2010) investigated whether companies could profit from greener manufacturing and found out that there was no significant relationship between greener manufacturing and corporate performance. Nune and Bennet (2010) did a study green operations initiatives in the automotive industry and established that the major vehicle manufacturers used green power like land fill gas, wind and solar energy as opposed to oil. Wong (2012) examined the influence of competitiveness on the success of green product innovation. The study revealed that green product and process innovation are positively associated with green product competitive advantage and green new product success. Ngniatedema and Li (2014) conducted an investigation on green operations and organization performance. The study established that companies in the manufacturing industries have a lower score in environmental impact and a higher score in green reputation than those in the services industry. Studies in Kenya have been less explorative in the adoption of green energy. The existing gaps include lack of business administration approach on the issues discussed (Ochieng, 2014; Lichts, 2014; Deepchand, 2016). This study intends to improve the field of research by applying an entirely different perspective of proving the actual problem that exists in Butali Sugar Company, and thus findings, conclusions, and recommendations will be of significant to future researchers, Butali Sugar Company management and other sugar production companies. It is due to the outlined problems that this study was undertaken to establish the effect of adoption of green energy and on performance of Butali Sugar Company in Kakamega County, Kenya.

## **GENERAL OBJECTIVE**

The main objective of the study was to establish the effect of green energy adoption on performance of Butali Sugar Company, Kenya.

## **SPECIFIC OBJECTIVES**

1. To assess the effect of pollution reduction on performance of Butali Sugar Company, Kenya.
2. To determine effect of the cost of production on performance of Butali Sugar Company, Kenya.
3. To establish the effect of organizational policy on performance of Butali Sugar Company, Kenya.
4. To examine the effect of organizational capacity on performance of Butali Sugar Company, Kenya.

## **THEORETICAL LITERATURE REVIEW**

### **Green Economic Theory**

Cato (2009) argues that Green economics seeks to move the target of our economy away from economic growth and towards flourishing, convivial human communities which do not threaten other species or the planet itself. It is inherently concerned with social justice since for a green economist equality and justice are at the heart of what we do and take precedence over considerations such as efficiency (Cato, 2009).

Green growth theory then starts from the simple observation that the natural environment is also a factor of production, but one which both classical growth theory, and historic patterns of economic growth in practice, have largely ignored (Nordhaus 1974, Solow 1974, Smulders 1999, Brock and Taylor 2005). The environment acts as a form of capital in three ways: it provides resources, it assimilates wastes, and it performs various 'environmental services' which sustain life, including climatic regulation and ecosystem health. This 'natural capital' has been undervalued both in economic theory and practice because it has been largely unpriced, provided as an apparently free gift of nature. Many of the environment's functions occur as common or collective goods without the property rights which attach to other factors of production, and without therefore the private incentive to value them properly in economic terms (Jacobs, 1991).

The standard economic concept to describe this is that of 'market failure'. Markets 'fail' when they do not take into account the full value of the activities within them. The production and consumption decisions which economic actors take are therefore distorted relative to those they would take if the environment were properly valued, in a whole series of ways. Natural resources tend to be over-exploited: soil eroded, fisheries depleted, water over-abstracted. Ecosystems which provide valuable services, such as wetlands and forests, are allowed to be degraded or destroyed. Resources such as energy and materials are used inefficiently, with an excessive generation of waste (and therefore pollution). And the amenity, health and cultural value of natural environments are under-appreciated.

In all these ways, green growth theory argues that current patterns of economic growth are *prima facie* sub-optimal. They misallocate resources between the different factors of production. They



under-invest in natural capital, and over-invest in activities which cause its degradation. If these systematic market failures were corrected, growth might be higher. Indeed, the situation is worse than this, because in many countries the environmental costs of using natural resources are not just un-priced, but their exploitation is actually subsidized. Subsidies for extracting and using fossil fuels, and for other forms of resource extraction and agriculture, are estimated at around \$1.1 trillion per annum (Dobbs et al. 2011). Such subsidies further distort production and consumption decisions away from their optimal path. From these premises, advocates of green growth argue that a range of different environmental measures and policies can be growth generating. In developing countries, much of the emphasis has been on the conservation and enhancement of natural capital, such as soil quality, fisheries, forests and habitats such as mangrove swamps and coral reefs. Arguing that in economies dependent on these resources, the net depreciation of natural capital is a retardant of growth in the same way that the net depreciation of physical capital would be.

The United Nations Environment Programme has gathered considerable evidence on the positive growth impact available from the conservation and sustainable management of natural resources (UNEP 2011). In some cases this arises from higher productivity in production of the resource; in others from the development of secondary, value adding, products which conservation of the resource allows; in some from the development of related industries, such as tourism. The UNEP report points out that many of these resources are controlled by the poor, and so strategies to conserve them and enhance their productivity are poverty-reducing as well as growth enhancing. Some of these growth benefits clearly show up in higher incomes, so are captured by the conventional growth indicator of GDP (gross domestic product). But others are unmeasured: it is difficult to capture the value which preservation of a mangrove swamp has for coastal defense, for example, or a forest for water supply

### **Resource-Based View Theory**

The theory was published by Barney in 1991 (Cited in Barney, 2011) as a managerial framework used to determine the strategic resources' potential to compete comparative high for the benefit of a firm. It examines how resources can drive competitive advantage. Competitive advantage is the ability to create more value than rivals, and therefore generate higher returns on investment. Sustainable competitive advantage requires enduring benefits through capabilities that are not easily imitated (Killen et al., 2012). The theory of resource-based view (RBV) posits that each organization is endowed with a finite amount of resources. RBV theoretically predicts intangible resources as the important factors for firm success (Amit and Schoemaker, 1993). Penrose (1959) is identified as one of the earliest major contributors to the theoretical underpinnings of the RBV (Kor and Mahoney, 2000). The heterogeneity approach posits that a firm does not achieve competitiveness because of their resources but because of its competence in making better use of its resources whereby the productive services of resources must be discovered over time as entrepreneurs interact with its resources and make subjective decision about resource allocation, deployment and maintenance (Penrose, 1959).

Technological leads, Production/process experience, customer loyalty and machine capacity are also resources of the firm (Wernerfelt, 1984). Wernerfelt (1984) further states that resources and products are two sides of the same coin for a firm. By specifying the size of the firm's activity in different product markets, it is possible to infer the minimum necessary resource commitments. Conversely by specifying a resource profile for a firm, it is possible to find the optimal product market activities. To address key issues in the formulation of strategy for diversified firms by Wernerfelt (1984) propose that firms should look at its resources rather than the traditional product perspective so as to achieve different immediate insights.

Firms can also be able to identify types of resources which can lead to high profits. Adopting and implementing green operations practices while striking a balance between exploitation of existing resources, development of new strategies and purchase of a bundle of resources in a highly imperfect market by basing the purchase on rare resources can maximize this imperfection increasing chances of buying cheap and getting good returns.

The resource-based view of a firm predicts that certain types of resources owned and controlled by firms have the potential and promise to generate competitive advantage and eventually superior firm performance (Tesot, 2012). These resources must be identified with key potentials, that is, valuable, rare, inimitable, and non-substitutable without great effort. Barney (1991) explains that resources are valuable if they help organizations to increase the value offered to the customers. This is done by increasing differentiation and decreasing the costs of the production (Rapert, Lynch & Suter, 1996). Resources that can only be acquired by one or few companies are considered rare. A company that has valuable and rare resource can achieve at least temporary competitive advantage (Porter, 1985).

The resource must also be costly to imitate or to substitute for a rival. The resource itself does not confer any advantage for a company if it's not organized to capture value (Barney, 1991). Only the firm that is capable to exploit the valuable, rare and inimitable resources can achieve sustained competitive advantage. To transform a short-run competitive advantage into a sustained competitive advantage requires that these resources are heterogeneous in nature and not perfectly mobile. If these conditions hold, the firm's bundle of resources can assist the firm to sustain above average returns (Porter, 1985).

In relation to this study, it can be noted that this theory is applied in that the use of green energy is meant to increase the use of locally available resources. The theory defines the characteristics of what a resource entails for it to be considered applicable in the resource based theory; and they included being less costly, capability of the firm to process or use, heterogeneous in nature and finally not perfectly mobile. These characteristics are rather borrowed in this study to represent the independent variables of the study, which are cost, existence of physical materials, knowledge or skills and policy on the adoption of green energy. In general, the Resource based theory is largely outlined to the study to show that locally available resources can be used for better processes of several aspects such as green energy. When establishing green energy, the benefits are meant to represent competitiveness to sugar processing companies. In this case, competitiveness is meant to



represent the dependent variable, which is adoption of green energy; which entails amount of energy, operational benefits, and surplus.

### **Innovation Diffusion Theory**

The theory was first Rogers' 1995, and states that innovation process is made up of stages as a process which relay on knowledge, persuasion, decision, implementation, and confirmation. The theory explains how, why, and at what rate new ideas and technology spread. Innovation in this case refers to establishing changes or new ideas in terms of methods, products and processes. Thus, in this study, the innovation referred to is green energy.

According to Rogers, knowledge to innovation being possible is observed. Knowledge in this case involves individual's ability to innovate and operate project functions. This is normally not the case of most organizations as they tend to lacks information about the innovation. Persuasion is the interest in the innovation. Thirdly, decision is adopted in the process of taking the concept of change, which weighs the advantages/disadvantages of using the innovation and decides to determine whether to adopt or reject the innovation. Implementation stage employs the innovation to a varying degree depending on the situation. It makes the adopter to determine the usefulness of the innovation and may search for further information about it. Finally, the confirmation stage finalizes decision to continue using the innovation and may end up using it to its fullest potential.

In this study, the theory can be used to address the relationship between the independent and the dependent variables. That the theory explains of innovation being passed through stages including knowledge, persuasion, decision, implementation, and confirmation. In this study, such elements form the independent variable in this study. Having the approach of the two relations, the study finds it fit to address the aspect of the study to be as follows: that knowledge is highly linked to the existing knowledge or skills (which is the third objective), that persuasion is largely linked to the ability to convince the use of innovation which is a general focus on all the objectives of the study (affordability in terms of cost, availability of material, supporting policy and staff competence). It can also be established that decision is meant to focus on persuasion levels. In regards to implementation and confirmation, the application is that this study intends to investigate the level to which independent variable has been adopted to adequately fill the need for the factors affecting the adoption of green energy in Butali Sugar Company.

## **EMPIRICAL REVIEW**

### **Pollution Reduction and Organizational Performance**

Manrique & Carmen-Pilar (2017) conducted an analysis on the effect of corporate environmental performance on corporate financial performance in developed and developing countries. The main objective of the study was to examine the effect of corporate environmental performance on corporate financial performance during a global crisis, depending on the economic development level of the country where a firm is located. A sample of 2982 large firms from 2005 to 2015 globally was used to collect panel data. Petersen's approach to these data was used by adjusting

the standard errors for clustering by both firm and year. The study established that adoption of environmental practices significantly and positively affects the corporate financial performance in developed and developing countries. However this effect is stronger for firms located in developing countries than those located in developed countries. The study concluded that the implementation of environmental practices such as waste management and reduction of pollution could have an important effect on the financial performance of a firm, because the profitability could be decreased by high production costs linked to environmental innovation according to neoclassical economic theory. However, from a natural-resource-based view and instrumental stakeholder theory, the adoption of environmental practices by core business strategy allows firms to save production costs by reducing environmental risks, while enhancing their relationship with the key stakeholders, which contributes to achieving competitive advantages and thus improves their corporate financial performance in the long term.

Dang, Wang and Zigan (2018) conducted a study on the effect of mandatory pollution abatement on corporate investment and performance based on the USA regulation. The study sought to establish the effect of mandatory pollution abatement on USA corporate investment and performance. The study carried out an empirical and theoretical analysis. The study established that environmental regulation can stimulate investment in innovation. For financially unconstrained firms, mandatory pollution abatement leads to more current R&D investment, more future investment in pollution abatement, reduces current profits, increases future profits and reduces the market value of the firm. However, if firms are financially constrained three of the five consequences are different. IT leads to less current R&D investment, less future investment in pollution abatement and lower future profits.

Graham &McAdam (2016) carried out a study on the effects of pollution prevention on performance. The study was based on two main objectives which included the effect of energy reduction and waste reduction on environmental performance which as a result affects cost performance. The moderating variables were environmental integration and environmental learning. The study was based on resource-based view theory and dynamic capabilities theory. The study used a descriptive research design. A semi-structure pre-defined interview guide was used to collect data. The data was analyzed using inferential and descriptive statistics. The study established that the implementation of pollution prevention practices may lead to improvements in environmental performance.

Mahapatra (2014) accordingly argues that investors view pollution control expenditures as a drain on resources that could have been invested profitably, and do not reward the companies for socially responsible behaviour. From this perspective is accordingly evident that firms engaging in using green energy would fail in maximizing shareholder value. However, this may not necessarily be true because shareholders are people who are not only trying to maximise profit, but maximise utility gains. Not purchasing the stocks of firms that engage in green energy use would be an ideal choice given that it is a costly proposition for firms and accordingly hurt profits if the sole purpose of purchasing stocks is to maximise profits. However, profits and money are only two of the factors that satisfy people. Mackey et al. (2017) explain that the opportunity to invest in a firm that is

engaging in specific socially responsible activities can be thought of as a ‘product’ that is sold by firms to potential equity investors as customers.

Currently, more and more people are aware of the need to be environmentally responsible. For example, according to the syndicated Green Gauge survey item asking who should take the lead in addressing environmental problems, Americans ranked individual Americans only after the federal government (SC Johnson, 2012). Individuals in the USA strongly believe that each individual should be actively engaging in environmentally responsible behaviour. One way of achieving this goal is being active in environmentally responsible behaviour such as purchasing stocks for firms that are environmentally responsible. Individuals can also buy products and services from environmentally responsible firms, but the impact is limited since one can only buy so much and products and services have low fluidity. On the other hand, purchasing stocks not only boasts high fluidity, but also gives flexibility in the amount of investment one can make.

### **Cost of Production and Organizational Performance**

Green et al (2012) conducted a study on the relationship between use of renewable energy and cost performance of firms in the UK. The study focused on establishing the effect of environmental conservation practices and performance of firms. The study assessed the performance of 52 manufacturing firms in the UK. A descriptive research design was used. Data was collected using semi-structured questions. The study established that there was a direct relationship between environmental protection and cost performance.

However, De Burgos-Jiminez et al (2014) in their study on environmental performance and firm financial performance in Mexico City, found no support for a direct link between environmental efforts and financial performance but strong support for a link between environmental performance and leaner performance. These studies have highlighted that improving environmental performance may be the key to improving cost and financial outcomes. The current study takes a step further by seeking to identify the relationship between pollution prevention through green energy adoption and cost performance.

Michaelowa (2007) conducted a study on the bagasse project in the Mumias Sugar Company. The bagasse project is being funded through equity and commercial loans. A huge amount of capital is obviously required to reap the benefits of the cogeneration potential of bagasse. There is need for capital to set up new cogeneration plants and to expand on the existing ones. The current sugar plants require conversion to accommodate condensing turbines and this requires significant capital injection. The success of the project also depends on a viable unit price for the sale of electricity generated from cogeneration. The cost of electricity from cogeneration will be more expensive than that from conventional fossil fuels. Electricity from cogeneration would invariably be more expensive than the average Eskom charge tariff, since much of Eskom's infrastructure is already fully depreciated, while operating costs are lower. Cogeneration would also involve more capital expenditure per unit since plants would produce smaller amounts of electricity than coal-fired power stations (Ministry of Energy, 2012).

There is only need to for enough capital to source appropriate technology for the energy conversion of bio energy to electricity. A viable price unit per unit of electricity generated from cogeneration has to be expeditiously agreed upon in order to encourage the private companies to invest in this project (Moomaw, 2017).

In order to determine the total investment costs for the dryer and turbine need to be calculated. The cost of capital for the considered pellet plant investment has been determined to 3.3 million USD and the breakeven investment cost to 4,7 million USD. Yet the economical calculations regarding the pellet plant investment have been based on a modest scenario it is profitable. Considering the vast difference between the nominal and the practical amount of excess bagasse Carlos Baliño has a great potential in increasing the amount of bagasse energy produced as well as the financial gain (Silva, 2017).

Although the efficiency rate differs this much, other circumstances like production variety, production stops and investment costs plays a big role in which boiler eventually is being used. Furthermore, the bagasse should be compressed to avoid the costs of big buildings for storage (Hugot, 1986). The properties and the chemical composition of bagasse combined with the low cost have made it an interesting environmental friendly alternative option to the materials being used today in several applications.

The focus of significance when mapping costs drivers and sources of income within the frames of production of bagasse energy can in an overall way be described as techno-economical. This as the techniques used in the production and in the manufacturing are of immense importance concerning the economical perspectives. Conversely, the interests within the market as well as the structure of the market are of equal prominence when overlooking the economics of pelletizing (Pirraglia et al., 2010).

When examining the costs for the production of bagasse energy there are several areas that need to be observed. A techno-financial analysis is required to map the various costs and areas of interest. In order to in an adequate way overlook the financial it is a necessity to observe mass balance, power use and furthermore analyze this financially (Pirraglia et al., 2010).

When overlooking the total costs for bagasse energy production the cost of raw biomass represents approximately 27%, which makes it greatest cost driver followed by labour costs depending on the location of the facility (Pirragliaet a., 2010). However the percentage of each cost driver changes depending on the capacity scale of the pellets factory. The capacity of the bagasse energy factory is therefore vital in order to find an optimum

### **Organizational energy policy and Organizational Performance**

Ngniadedema and Li (2014) carried out a study on the relationship between green operations and organizational performance in top 500 publicly traded companies in the United States of America. Based on metrics for environmental impact and green reputation, manufacturing companies scored lower on the environmental impact metric and higher on the green reputation metric than companies in the service industries. The overall impact of green operations was found to be

different between the manufacturing and service firms studied. For manufacturing firm's environmental impact score and green policies and performance score were found to have an impact on organizational performance; while green reputation plays a more important role in impacting the organizational performance of service firms.

In Kenya, due to the policy framework, pricing, statutory requirements that allow only KPLC to buy and distribute power from other alternative sources and other limitations on the sale of electricity, sugar factories in Kenya have been unable to exploit all the bagasse produced during sugarcane processing to produce sugar. These constraints continue to negatively impact bagasse based cogeneration of electricity in Kenya. (Refer attached document Cogeneration) (Araújo, 2017).

A barrier arising from the fact that still the government does not have a comprehensive policy on price that KPLC is to pay on power from cogeneration sources and this has made it difficult to have strict and precise projection on sales revenue and profits, this fact can also deter investors and financiers. The pricing aspect has made cogeneration projects not to be pursued by most sugar companies in the country, as KPLC tends to offer a lower price for cogenerated power than from fossil fuel sources on the assumption that production costs are low. Recently, the Government ordered Kenya Electricity Generating Company not to charge KPLC the earlier agreed rates, as it was felt this would destabilize KPLC commercial recovery (Wainaina, et al., 2012).

It is difficult to convince the KPLC (local power distributor) that the energy to be acquired, which is generated during the harvest season, is sufficiently reliable to be accounted in the distributor's planning. Other barriers have more to do with the lack of adequate commercial contractual agreements from the energy buyer, KPLC (i.e. bankable long-term contracts and payment guarantee mechanisms for noncredit worthy local public-sector and private customers) making it much more difficult to obtain long term financing from a commercial bank and/or a development bank. Some other financing barriers occur simply due to prohibitively high transaction costs, which include the bureaucracy to secure the environmental license and electricity generation license (KPLC, 2016).

Skills development systems need time to respond to the new needs and confidence that policies will sustain the transition and continue to create demand for new skills. An efficient training system for renewable energy must be integrated within overall policies to support the growth of the sector, involve social partners in the design and delivery of training, and include a good combination of practical and theoretical knowledge. There is a need for policy to focus on ensuring that the transition to renewable sources of energy is a Just Transition for those working in fossil energy sectors. There is a need for policy-makers promoting the transition to renewable energy to take account of Decent Work principles when designing policies and interventions (Balachandra, 2009).

Policy support has led to high rates of investment, and growing numbers of people employed in the sector. For a number of important technologies, manufacturing is limited to a small number of developed and emerging economies. Emerging economies are rapidly catching up, and have

surpassed developed countries in deployment and number of installed capacity in some areas (Garcia-Perez, 2010).

### **Organizational Capacity and Organizational Performance**

Jose et al. (2009) did a literature review of the quantitative studies that have analyzed the impact of green management on financial performance. A total of 32 studies were identified, examining the environmental variables used, the financial performance variables, the statistical analyses, and the main findings obtained by the studies. Some of the studies quoted in the literature are Hutchinson (1996) analyzed the integration of environmental policy with business strategy studying several firms. Marcus and Geffen (1998) studied the processes by which distinctive competencies are acquired based on the case of pollution prevention in electric generation. Enz and Siguaw (1999) examined four hotels that agreed that cost savings, operating efficiencies and excellent marketing opportunities derived from their environmental initiatives. The Findings were mixed, but studies where a positive impact of environment on financial performance is obtained were predominant. In addition, the findings show that the set of firms, industries and countries are varied. Some studies use environmental management variables and other works employ environmental performance variables, and regression analysis prevails. The study however does not consider studies that analyze the influence of environmental management on environmental performance. The study offers interesting implications for managers, pointing out that a real commitment to green management may result in a positive influence on financial performance.

Nishant (2012) did an empirical examination on green information system and organizational performance by using data from secondary sources. The study found out that research in the area was relatively sparse. Bose and Luo (2012) found out that the likelihood that companies would adopt green IT initiatives depend on both environmental and organizational factors of which the primary one being champion support. The support of a champion is very critical since he is the one who coordinates the implementation process based on his education and attitude (Bose & Luo, 2012).

Menzel et al. (2010) did a study to investigate the trend and effect of environmentally friendly manufacturing on the financial performance of companies in the European automotive and pharmaceutical industries specific attention given to resource utilization. The method of research was a survey of annual and sustainability reports published by companies and recording the change in resource usage as well as the financial performance of the companies. The study showed no significant relationship between greener manufacturing and corporate performance. However, a trend in decreasing resources, specifically electricity was found. Furthermore, a trend in reducing carbon was also found.

Demand for people depends on the level of deployment and the level of maturity of the technology. Modern bioenergy involves advanced technologies, and several such technologies are expected to mature in the years to come. Amongst these are cellulosic ethanol, biomass integrated gasification combined cycle (IGCC), advanced automated small gasifier systems, biomass-fired Stirling engines, biochar production, torrefaction and biogas-based fuel cells. Almost all development



work on these technologies is being undertaken in industrialized countries. While energy consumption in the emerging economies has been growing rapidly, consumption of modern bioenergy in most of these countries is still generally low, with the exception of ethanol use in Brazil. Most developing countries have yet to start deploying modern and advanced bioenergy technologies (Ahmed, 2016).

From the sugar mill point of view, the great majority of sugar mills do not consider investment in cogeneration (for electricity sale) as a priority. The sector even in the new political context, does not seem to have motivation to invest in a process that it sees with mistrust and no guarantees that the product will have a safe market in the future”. Moreover, “the sugar mills are essentially managed by the government, which hurdles the association with external financial agents” that would allow the sector to be more competitive and diversifying its investment. From the point of view of the economic agents, the excessive level of guarantees required to finance the projects is a common barrier to achieving a financial feasibility stage (Dallemand, et al., 2011).

Due to the nature of the business in the sugar industry, the marketing approach is narrowly focused on commodity type of transaction. Therefore, the electricity transaction based on long-term contract represents a significant breakthrough in their business model. In this case, the electricity transaction has to represent a safe investment opportunity from both economic and social environmental perspective for convincing the sugar mills to invest in (FAO, 2017). There are also questions regarding the managerial capacity of the companies that comprise the Kenyan sugarcane industry. Companies have in many cases demonstrated the will to undertake investments in new technologies, but without sufficient financial and entrepreneurial capacity to complete such projects (KPLC, 2016).

## **RESEARCH METHODOLOGY**

### **Research Design**

This study adopted descriptive survey design that primarily targeted the green energy project at the Butali Sugar Factory and how it has affected its performance. This method is very important in the quest of determining the answers to who, what, where and how questions (Mugenda & Mugenda 2003). The design also captures all important aspect of the study while employing a unit and investigations.

### **Population**

Mugenda and Mugenda (2009) define the target population as all the members of real or hypothetical set of people, events, or objects from which the study wants to generalize the results of the research. The target population was 204 respondents. They consisted of top managers and heads of departments connected to the Butali Sugar Mills Limited bagasse adoption (Butali Sugar Mills Limited’s HRM report, 2019).

## **Sample Procedure and Sample Size**

Lavrakas (2015) defines sampling size as the selected number of observations from the general population which could be equal to the population if census is conducted or smaller than the population with the use of other types of sampling procedures. The study conducted an estimator using the Yamane's formula to identify the sample size for the study. In regards to this formula (error = 0.05 or 5%), the sample size was 134.

## **Data Collection Instruments**

The primary data that was collected in this study was both quantitative and qualitative data. The data was collected using structural questionnaires that were administered to the respondents. This questionnaire had both closed and open-ended questionnaire that captured all the variables. Open ended questions permitted the free response from the respondents without any suggestion of answers. Closed ended questions enabled the researcher to arrange data into started alternatives. Questionnaire is used because it allows the researcher to collect a larger amount of data within limited area (Orodho, 2003). These questionnaires were self-administered, dropped and picked later.

## **Data Collection Procedures**

The researcher sought for approval from the university for data collection which was used to seek for permit from NACOSTI. Authority was also sought from the Butali Sugar Company and project management team before data collection. The questionnaires were dropped at the respondents working place and the respondent was given one week to fill them and then the researcher collected the filled questionnaires. The researcher preferred the 'drop and pick' method so as to give the respondents as enough time as possible to the respondents to fill the questionnaires.

## **Data Analysis and Presentation**

After data collection, data was edited, referenced coded to facilitate statistical analysis. Data collected was analyzed using both qualitative and quantitative methods. Data was analyzed using Statistical Package for Social Sciences (SPSS version 21). After data cleaning which entails checking for errors in entry, investigate differences between and among groups and frequencies were estimated for all variables and information presented in form of frequency and tables. For quantitative techniques, inferential statistics were applied and drawing conclusions with predictions about the properties of a population based on information obtained from a sample. Correlation coefficient was used to measure the strength and direction of a linear relationship between two variables. A P-value of  $<0.05$  was significant, and the opposite insignificant. Multiple regression analysis involved finding the best straight-line relationship to explain how the variation in an outcome (or dependent) variable, Y, depends on the variation in a predictor (or independent or explanatory) variable, X. Once the relationship was estimated, it was possible to use the equation:

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \dots \dots \dots \epsilon$$

Where: Y= Performance of Butali Sugar Company;  $\alpha$  = Constant;  $\beta_0$  = Coefficients;  $\beta_1$ ,  $\beta_2$ , and  $\beta_3$  = Coefficients of the independent variable;  $X_1$  = Pollution reduction;  $X_2$  = cost reduction;  $X_3$  = organizational Policy;  $X_4$  = organizational capacity;  $\epsilon$  = Standard error term

## **RESEARCH RESULTS**

The study sought to establish the effect of green energy adoption on the performance of Butali Sugar Company. The study sought to establish the effect of pollution reduction, cost of production, organizational policy and organizational capacity as aspects of green energy adoption on firm performance. The target population was 204 management staff where Yamane's formula was used to develop a sample of 134 respondents. The response rate was 93.28% with 125 questionnaires sufficiently completed and submitted and hence used for analysis. Both descriptive and inferential statistics were used to analyze and present data.

### **Pollution Reduction and Firm Performance**

The study established that pollution reduction as a means and an end to green energy adoption positively and significantly influenced performance of Butali Sugar Company Limited. The study established that Butali Sugar Mills Limited has minimal emissions to the atmosphere, the factory uses renewable sources to reduce environmental degradation and the firm has embarked on environmental conservation in close environs. The respondents were neutral on whether the company has a recycling plant for factory wastes, the firm collaborates with other firms that make use of factory wastes and also that the company stores waste products safely and disposes them well due to adoption of green energy. This indicates that the firm had significantly reduced emissions to the atmosphere by adopting green energy, enhanced use of renewable energy, improved environmental conservation, recycles wastes, embraces environmental friendly waste disposal and collaborates with other firms on waste management. This reduces pollution and contributes to efficient firm performance.

### **Cost of Production and Firm Performance**

The study found out that cost of production reduction due to green energy adoption significantly influenced performance of Butali Sugar factory. The study established that to a significant extent the company has reduced energy costs through green energy adoption, the cost of running factory machines and equipment is affordable and that the company has scaled down on equipment and machine wear and tear due to green energy use. The respondents however indicated that to a moderate extent there are adequate finances for the projects personnel, the cost of transportable is reasonable and the price of license to produce power is fair. This indicates that green energy adoption had significantly reduced the cost of production in the firm despite their being inadequate finances for the project, cost of transportation being slightly higher and the price of license to produce power being moderately higher

### **Organizational Policy and Firm Performance**

The study established that availability of relevant organizational policy on green energy adoption positively influenced performance Butali Sugar Company. The study established that Butali Sugar Millers Limited has the license for production of green energy, the company has a policy for green energy use and environmental conservation, the organization operates on standard regulations that permit its production and supply of green energy, there is a safety policy for employees working on the project and that the company has permit to generate the green energy. The respondents were neutral on whether the company coordinates with other organizations that permit its program of green energy. This generally indicates that firm has a clear policy guideline on green energy adoption, complies with government policy and regulations governing the project.

### **Organizational Capacity and Firm Performance**

The study established that organizational capacity to implement green energy project significantly influenced performance of the factory. The study established that the project personnel have adequate education, they are well trained and that there is enough skilled personnel for technology control. The respondents were neutral or averagely agreed that the employee in the project have many years of working experience, the management is supportive in provision of guidance, there are adequate stakeholders supporting the project, there is adequate bagasse for green energy generation, the company has adequate facility to produce energy, the storage capacity for bagasse is large enough the company is able to store a lot of green energy, the facility has adequate space for the process and there exists required technology for the adoption process. This indicates that the company to a moderate extent had the necessary human resource capacity, technology, storage, stakeholders, raw material and management support to execute the green energy adoption process.

## **INFERENTIAL STATISTICS**

The study used a multiple regression analysis to establish the relationship between the variables of the study. The findings of coefficient of correlation and coefficient of determination are as shown in Table 1.

**Table 1: Model summary**

<b>Model</b>	<b>R</b>	<b>R square</b>	<b>Adjusted r square</b>	<b>Std. Error of the estimate</b>
1	.869 <sup>a</sup>	.856	.851	1.24416

a. Predictors: (constant), pollution reduction, cost of production, organizational policy and organizational capacity

The study shows that coefficient of correlation R of 0.869 an indication of strong of correlation between the variables. The adjusted R<sup>2</sup> was 0.851 which implies that 85.1% of the variation in firm performance was accounted for by the four independent variables which include: pollution reduction, cost of production, organizational policy and organizational capacity. The residual of 14.9% can be explained by other variables not incorporated in the current study.

An ANOVA was conducted at 95% level of significance. The findings of  $F_{\text{Calculated}}$  and  $F_{\text{Critical}}$  are as shown in Table 2.

**Table 2: ANOVA**

Model	Sum of squares	Df	Mean square	F	Sig.
Regression	836.211	15	55.7474	28.6325	.000 <sup>b</sup>
Residual	214.134	110	1.947		
Total	1050.345	125			

a. Dependent variable: Firm performance

b. Predictors: (constant), pollution reduction, cost of production, organizational policy and organizational capacity

It was established that the study had  $F_{\text{Calculated}}$  of 55.7474 and  $F_{\text{Critical}}$  was 7.51224, this show that of  $F_{\text{Calculated}} > F_{\text{Critical}}$  an indication that the overall regression model was significant for the study. The p value was  $0.00 < 0.05$  an indication that at least one independent variable significantly influenced the performance of Butali Sugar Millers Limited, Kenya.

The study used a regression coefficient to establish the effect of individual variables of green energy adoption on performance of Butali Sugar Company bagasse project. The findings are indicated in Table 3.

**Table 3: Regression Coefficient**

Model	Unstandardized coefficients		Standardized coefficients		Sig.
	B	Std. Error	Beta	T	
(constant)	5.987	1.05		2.316	.000
Pollution reduction	0.855	.033	.471	2.104	.000
Cost of production	0.847	.024	.125	3.628	.000
Organizational policy	0.828	.052	.404	2.531	.000
Organizational capacity	0.811	.020	.463	2.361	.000

a. Dependent variable: Firm Performance

$$Y = 5.987 + 0.855X_1 + 0.847X_2 + 0.828X_3 + 0.811X_4$$

Where: Y = Performance of Butali Sugar Company Limited;  $X_1$  = Pollution reduction;  $X_2$  = Cost of production;  $X_3$  = Organizational Policy;  $X_4$  = Organizational Capacity

Table 3 indicates that all variables held constant, firm performance would be at 5.194 this indicates that performance of the factory can still take place without the influence of the stated variables. The variable coefficients indicate that the relationship between green energy adoption and firm performance was positive and significant. These findings are similar to those by Aimable, Shukla and Oduor (2015) who on their study on effects of risk management methods on project performance in Rwandan Construction industry. The researchers indicated that detailed that risk management practices have a significant and positive effect on project performance.

The p values of all the independent variables which include project planning, monitoring and evaluation, communication and stakeholder participation were  $0.000 < 0.05$  an indication that the variables significantly influenced performance of projects in Nairobi City County. This is supported Ng'atindema & Li (2014) who in their study on the relationship between green energy operations and organizational performance concluded that green energy adoption enhances organizational performance by reducing cost of operation, reducing pollution and promoting generally environmental conservation. The study indicated that green energy operations ranging from having a relevant and favorable organizational policy, capacity, reduced pollution and cost of production have significant and positive effect on manufacturing firms' performance.

## **CONCLUSION**

On the effect of pollution reduction on performance of Butali Sugar Company, it was concluded that the firm had significantly reduced emissions to the atmosphere by adopting green energy, enhanced use of renewable energy, improved environmental conservation, recycles wastes, embraces environmental friendly waste disposal and collaborates with other firms on waste management.

On the cost of production affect performance Butali Sugar Company, it was concluded that green energy adoption had significantly reduced the cost of production in the firm despite their being inadequate finances for the project, cost of transportation being slightly higher and the price of license to produce power being moderately higher.

On the extent that organizational policy influences performance of Butali Sugar Company, the study concluded that the firm has a clear policy guideline on green energy adoption, complies with government policy and regulations governing the project.

On the effect of organisational capacity on performance of Butali Sugar Company, the study lastly concluded that the company to a moderate extent had the necessary human resource capacity, technology, storage, stakeholders, raw material and management support to execute the green energy adoption process.

## **RECOMMENDATIONS**

### **Effect of pollution reduction on performance of Butali Sugar Company**

Butali Sugar Company should embrace the implementation of environmental practices such as waste management and reduction of pollution could have an important effect on the financial performance of a firm, because the profitability could be decreased by high production costs linked to environmental innovation according to neoclassical economic theory. However, from a natural-resource-based view and instrumental stakeholder theory, the adoption of environmental practices by core business strategy allows firms to save production costs by reducing environmental risks, while enhancing their relationship with the key stakeholders, which contributes to achieving competitive advantages and thus improves their corporate financial performance in the long term.



### **Effect of the cost of production on performance of Butali Sugar Company**

There is a direct link between environmental efforts and financial performance but strong support for a link between environmental performance and leaner performance. Studies have highlighted that improving environmental performance may be the key to improving cost and financial outcomes. The current study takes a step further by seeking to identify the relationship between pollution prevention through green energy adoption and cost performance. There is need for capital to set up new cogeneration plants and to expand on the existing ones. The current sugar plants require conversion to accommodate condensing turbines and this requires significant capital injection. The success of the project also depends on a viable unit price for the sale of electricity generated from cogeneration. The cost of electricity from cogeneration will be more expensive than that from conventional fossil fuels.

### **Effect of organizational policy on performance of Butali Sugar Company**

Based on metrics for environmental impact and green reputation, manufacturing companies scored lower on the environmental impact metric and higher on the green reputation metric than companies in the service industries. The overall impact of green operations was found to be different between the manufacturing and service firms studied. For manufacturing firm's environmental impact score and green policies and performance score were found to have an impact on organizational performance; while green reputation plays a more important role in impacting the organizational performance of service firms. A barrier arising from the fact that still the government does not have a comprehensive policy on price that KPLC is to pay on power from cogeneration sources and this has made it difficult to have strict and precise projection on sales revenue and profits, this fact can also deter investors and financiers. The pricing aspect has made cogeneration projects not to be pursued by most sugar companies in the country.

### **Effect of organizational capacity on performance of Butali Sugar Company**

The Findings were mixed, but studies where a positive impact of environment on financial performance is obtained were predominant. In addition, the findings show that the set of firms, industries and countries are varied. Some studies use environmental management variables and other works employ environmental performance variables. The study offers interesting implications for managers, pointing out that a real commitment to green management may result in a positive influence on financial performance. The study however does not consider studies that analyze the influence of environmental management on environmental performance thus further studies should be carried out to analyze the influence of environmental management on environmental performance.

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