CAPACITY UTILIZATION, QUALITY OF TEA AND RETURNS TO KTDA FACTORIES IN KENYA

BY

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DECLARATION

I, the undersigned, declare that this research project is my original work and that it has not been presented in any other University or Institution for academic purposes.

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This research project has been submitted for examination with my approval as the University Supervisor**.**

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DEDICATION

I dedicate this research project to my family, Waruguru my wife, Wambui my daughter, Mukinyi and Mucheke, my sons and my parents Mucheke and Wambui for their love and sacrifice for me.

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LIST OF ABBREVIATIONS

AC	Actual Capacity
AFFA:	Agriculture, Fisheries and Food Authority
AO	Actual Output
CTC	Cut, Tear and Curl
CU	Capacity Utilization
DC	Designed Capacity
EATTA	East African Tea Trade Association
EC	Effective Utilization
FAO	Food and Agriculture Organisation
GDP	Gross Domestic Product
GOK	Government of Kenya
IISD	International Institute for Sustainable Development
ITC	International Tea Council
KTDA	Kenya Tea Development Agency Limited
KTGA	Kenya Tea Growers Association
KNBS	Kenya National Bureau of Statistics
KSH	Kenya Shilling
NTZDC	Nyayo Tea Zones Development Corporation

TBK	Tea Board of Kenya
TRFK	Tea research Foundation of Kenya
UK	United Kingdom
UON	University of Nairobi
USD	United States Dollar

ABSTRACT

The relationship between capacity utilization, quality of tea and returns to KTDA factories in Kenya is key to over half a million small scale tea farmers who have invested heavily in these tea factories and whose livelihood depends on the returns from the factories. Capacity utilization is one of the most important factors in determining the financial performance in both manufacturing and service industries. The objective of this study was to establish the capacity utilization in KTDA factories in Kenya and how capacity utilization affects both the quality of tea and returns to the factories. A descriptive research design was adopted. A population of 54 factories was used. Questionnaires were sent to all the 54 factories through their respective Regional Managers to provide secondary and primary data and information on factory capacity, payments to small scale tea farmers and average tea auction prices which were used for the tea quality index. Quantitative techniques were used in analysing the data in this study. The study found out that there is a strong relationship between capacity utilization and returns for KTDA factories and less significant relation between the capacity utilization and quality of tea in KTDA factories. The study recommends KTDA management to improve on capacity utilization in the tea factories because it was found to positively affect returns without compromising on quality.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

Tea (*Camellia Sinensis*) was discovered in about 2737 BC by the Chinese Emperor Shen Nong when a tea leaf accidentally dropped in his boiled water from a tea tree and he liked the pleasant aroma and flavour, however tea was still in use as a medicinal herb by Chinese people (Chow & Krammer, 1990). Today tea is grown as a commercial crop in many countries all over the world and it is the most popular drink in the world only second to water. Tea is rich in antioxidant compounds called flavonoids which constitute 35% of the weight of tea (Tea Council of Canada, 2012). Research has confirmed that flavonoids are potential antioxidants that have biological activities and may be responsible for many of the health benefits of tea. Tea contains no additives and has been chosen as a drink which is most calming and refreshing according to healthy drink survey conducted in Britain and sponsored by the UK Tea Council (EATTA, 2013).

The tea industry employs more than 13 million people around the world. Tea grows well at high altitudes and in slightly acidic soils and can therefore be cultivated in areas unsuitable for other crops. Tea is grown in 45 countries in the world and in year 2011, 4.6 million metric tons of tea was produced on 4.0 million hectares. (Ministry of Plantation and industry, Colombo, 2012). Most of this tea is primarily produced in Asia and Africa, with China, India, Kenya, Sri Lanka and Turkey accounting for 76 per cent of global production (IISD, 2014).

Unlike coffee and cocoa, about 60% of the tea produced in the world is consumed by the producer countries. China and India, the world largest producers of tea in the world consume 73% and 81% of their total production respectively (Monroyl, Mulinge

&Witwer, 2012). Nevertheless, a lot of tea is exported annually. In the year 2011 for example, 44 per cent of global production worth US$6.6 billion was destined for export (Food and Agriculture Organization of the United Nations (FAO), 2013).

About one-quarter of trade is destined for Russia, the United States and the United Kingdom (FAO, 2013). About 85% of global tea production is sold by multinationals, three of which control about 20% of the market: Unilever (>12%), which is also the biggest tea multinational in Kenya, Tata Global Beverages (>4%), and Twinings (>3%) (IISD report, 2014). Consequently, small tea farmers have little influence over the tea trade.

1.1.1 Capacity Utilization

Capacity is the maximum output rate of a facility. Designed capacity is the maximum output rate of a facility under ideal conditions while effective capacity is the maximum output rate of a facility under normal (realistic) conditions. According to Iraki (2013), capacity utilization can make all the difference between economic progress and poverty because there is a lot of idle capacity in all nations including the developed world like America. It is an important measure of production efficiency in comparison with the set targets, past achievements, and an indicator of economic performance. Capacity is very important but least understood concept in manufacturing and business world. It is measured differently depending on category of business and the level of value chain. For example, some financial managers might measure plant capacity in terms of the equipment installed in the plant while operational supervisors might measure capacity in terms of worker efficiency. Ragon (1976) defined an organization's productive capacity as the total level of output or production that the organization could produce in a given time period. Capacity utilization is the percentage of the firm's total possible production capacity that is being used. Therefore, an organization should be most

efficient if it is running at 100% capacity utilization. An organization's full capacity is the minimum point on total cost function, a full input point on the aggregate production function and a bottleneck point in a general equilibrium system.

Mathematically, capacity utilization is the actual output expressed as a percentage of potential output or designed capacity. (CU=AO/DC %), where CU is capacity utilization, AO is actual output while DC is the designed capacity. The Federal Reserve Board and U.S. Census Bureau's gives capacity utilization (CU) a figure of less than or equal to 1.0 or 100%. If CU = 1.0, the production entity is operating at maximum capacity utilization. A value of CU > 1.0 implies that there is a shortage of capacity relative to demand and CU<1 implies there is excess capacity (Kirland, Walden &Ward, 1999). However in real life situations, it is very difficult to achieve 100% capacity utilization due to factors limiting production. The decision on what capacity to install should be informed by capacity analysis based on the firm's future demands.

Utilization of full capacity in the tea industry is challenging given the fact that the production of green leaf (raw material for tea) is seasonal and weather dependant. However, a lot need to be done to improve the capacity utilization at tea factories in order to reduce the cost of production and improve returns. The main focus of this research was on the capacity utilization at the tea factories and how it affects quality of tea and the returns to the factories. This will help the factory management to improve on utilization of the already existing factory capacity and formulation of policies that guide on future capacity expansions.

1.1.2 Quality

Quality has been described in many various ways but quality in a business sense is meeting and/or exceeding the customer's expectations. This refers to both products and

service (Zeithaml & Bitner, 1990). This was also supported by a research done by Pheri& Mcwabe (2013) printed in international journal of research and social science. Quality has been described as fitness for purpose or freedom from deficiencies (Juran, 1988). It has also been described as the total composite product and service characteristics of marketing, engineering, manufacturing and maintenance through which the product and service in use will meet the expectations by the consumer (Feigenbaum, 1983).

In the past, quality was thought to mean a focus on doing the repeatable things well (Miller & Pearce, 1988). It suggested predictability and reliability and was applied almost exclusively to the manufacturing environment. Further, it emphasized only incremental improvements, building on what was already in place, improving repeatability, refining and perfecting the existing process. These definitions, although trying to define the word quality, are all inherently different. It is therefore necessary to consider International Standards Organization (ISO, 1986) Standard 8402-1986 in order to standardize the definition. ISO in 1986 attempted to rationalize the range of opinions on quality issue by releasing its first quality standard. This standard defines quality as "the totality of features and characteristics of a product or service that bear on its ability to satisfy stated or implied needs.

In the tea industry, the prices of tea in the international tea auctions are primarily based on the quality of tea on offer and the prices are therefore a very strong indicator of tea quality. The tea buyer at the auction gives the highest bid based on that which he considers “fit for purpose”. Every tea producer or factory is therefore constantly trying to improve and offer the quality demanded by the market and that which will meet and exceed the customer’s expectations. In this research therefore, the auction tea prices will be used as the measure for quality.

1.1.3 Returns

Return is used as a measure of business performance. There are several ways of measuring financial performance but one of the most popular method is the use of internal rate of return (IRR). The main interest of an investor is how much income he will get from his investment within a given period of time. IRR is expressed as a percentage and in financial terms, rate of return means profit derived from an investment. The purpose of calculating the rate of return on investment is to measure the financial performance, assess the desirability of a project and make a decision on valuation of firms. Rate of returns indicators are important for monitoring the economic performance of both public listed corporations and government enterprises (Feenstra & Wang, 2000). In this research the term return is used in the context of the benefit distributed to the owner of a factor of production. In the case of the KTDA factories, the return is given to the small scale tea farmer who is a shareholder of the factory and supplies the raw material for tea manufacture.

1.1.4 Tea Industry in Kenya

Tea is a perennial crop, which is grown for its leaves that are processed to make tea for preparing beverages. A European settler Mr.G.W.L.Caine introduced tea into Kenya from India in 1903.The first tea bushes have now grown into large trees, forming a historic feature on what is now Unilever's Mabroukie Tea Estate. Tea was exclusively grown in estates by the private companies, which were owned by the white settlers who started commercial tea farming in 1930's. Small-scale tea farming was started as a pilot scheme in 1954 in Nyeri and Kericho districts. In 1961, it was declared a special crop under section 191 of agriculture Act (Cap318) and was placed under the management of Special Crops Development Authority (SCDA) in the same year. The Special Crops Development Authority (SCDA) was established under the Agriculture Act in 1960 to

promote the cultivation of cash crops including tea. In 1964, the Kenyan Tea Development Order was promulgated to form Kenya Tea Development Authority (KTDA), a government parastatal, to promote smallholder tea growers in the processing and marketing of tea.

In the year 2000, the industry was fully liberalized to promote efficiency and competitiveness as well as to attract private sector investment and grower participation in factory ownership and management. Kenya Tea Development Authority was therefore transformed into Kenya Tea Development Agency, a private company. The ownership of the smallholder factories was transferred to the small-scale growers under the management of their own managing agent, KTDA.

Tea is produced in high altitude areas ranging from 1500 and 2700 m above the sea level where rainfall ranges between 1200mm and 2700 mm annually with long sunny intervals and well-drained soils. Suitable temperature for tea growth ranges from minimum 12^0C to a maximum of 28^0C and a soil PH range of between 4.5 and 6.5 beyond which the tea is retarded(TRFK,2002). The major tea growing counties are Nakuru, Kericho, Bomet, Nandi, Elegweyo Marakwet, Nyamira, Kisii, Kakamega, Kiambu, Murang'a, Nyeri, Kirinyaga, Embu, Tharaka Nthi and Meru. (Appendix I)

Tea production in Kenya is divided into two main categories, privately owned large plantations, which account for about 40% of the total tea production in the county and the smallholder tea farmers who produce the remaining 60% of Kenyan tea. The smallholder tea is produced under the management of the Kenya Tea Development Agency (KTDA). The management of the smallholder tea by KTDA involves supervising and advising on good husbandry practices; provision of inputs on credit, collection and transportation to the factories, processing, marketing of the final product

and payment to farmers. Payment to farmers is done on monthly basis pegged on the quantity of tea that is sold to the factory for that particular month. The farmers also receive a lump sum payment in the month of May and November every year generally referred to as tea bonus based on the performance of every factory. KTDA therefore plays a key role in rural economic development in areas where tea is grown in Kenya.

Tea estates are privately owned companies which produce, process and market their own tea individually. The largest tea estate belongs to Unilever Kenya Ltd while the others are James Finlay (Kenya) Ltd., Eastern Produce Kenya Ltd. and George Williamson Tea Kenya Ltd. Since the liberalization of the Tea industry in the year 2000, a lot of changes have taken place in the industry both locally and globally. In the last 10 years, global tea production has outstripped demand by about 2.5 percent annually but the trend will change in the next decade where production and demand are projected to reach an equilibrium with production increasing by 5% and consumption by the same margin (FAO Report 2014). Consequently, with the average global auction prices projected to remain the same in the next decade (FAO Report 2014), then the returns to the farmer are expected to decline due to escalating costs of production. Miano (2010) observed that some farmers in Kenya had switched resources to other substitutes like horticulture and dairy farming due to the escalating cost of tea production arising from high cost of labour, fertilizers, electricity, furnace oil as well as high taxation leading to reduced grower's earnings.

The tea industry makes an important contribution to the Kenyan economy. Currently tea contributes 4% of the GDP and is the leading foreign exchange earner in Kenya, contributing 23% of foreign exchange (KNBS report 2014). In the year ended 31st December 2013, tea exports earned the country about Ksh. 114 billion placing it first to tourism and horticulture. This compares favourably with Ksh. 112 billion earned in

2012(EATTA, 2014). The industry supports directly and indirectly about 4 million people making tea one of the leading sources of livelihood in the country.

This sub sector also provides market for the industrial goods for example fertilizers besides providing employment to Kenyans. The incomes from this sub sector are normally used by economic agents to finance major household expenditure such as, food, health care and school fees. The tea industry therefore has a direct impact on rural poverty and any decline in its performance will lead to increased poverty in the tea growing regions and in the overall economy.

1.2 Problem Statement

Capacity utilization is a key factor in economic development for any country. For any meaningful economic development to take place, firms and nations must address the issue of efficiencies by utilizing idle capacities in the existing facilities. This should be improved to CU=1 or to an optimum depending on the industry. This will consequently bring down the cost of production and lower the cost of goods and services. Reduction of idle capacity also reduces wastage of raw materials and finished products in manufacturing industry. In the long run, the quality and returns are expected to improve.

In the last few years, the tea prices in the world market have been on the decline and the supply outstripped demand. The cost of production has been escalating due to the rising costs of inputs, equipment and labour. This has reduced the net tea earnings to the producer and particularly the small scale tea farmer. A lot of interventions have been done especially in the area of research in order to improve productivity in terms of high yielding clones, drought resistant, pests and disease resistant clones. There is some good progress in marketing since liberation of the tea industry in Kenya. However, a lot needs to be done to reduce the escalating cost of production by

addressing the efficiency in terms of capacity utilization both at farm and the factory level. This research will focus on capacity utilization at the factory production level with an objective of optimising capacity utilization that is currently installed in the tea factories. Secondly, it will identify the bottlenecks in the existing systems by applying the theory of constraints. This will help the factory management to improve on factory processing capacity by matching or synchronising existing capacities of individual machines in the production line. Addressing such bottlenecks in the existing systems from an informed point of view will cut down the cost of installing an entire production line and save the farmers money.

Nyaoga, Wang and Magutu (2015) in their research to establish the relationship between capacity utilization and value chain performance, and established positive relationship. One of the recommendations from the research was that tea processing factories should invest more in effective capacity utilization. However, the study did not establish up to what level the factory management needs to invest in effective capacity utilization in order leap maximum benefits.

Mbuthia (2013) in his research, a case study at Gacharage Tea Factory looked at the design of the withering troughs in order to improve withering efficiency. The research came up with a more improved engineering design of a withering trough which would improve efficiency in the withering section and save on energy utilization. Consequently, this would improve on capacity utilization of the withering section. However, the research did not address capacity utilization in entire production system but rather focused on efficiency of the withering troughs.

Karugo (2003) in his study on effects of liberalization of tea industry on income of smallholder tea producers in Central Kenya found out that the farmers did not benefit

much from the liberalization of tea industry and the production costs continued to rise and farmers continued to increase production even when the market prices were on a downward trend. He found out that production cost in a given factory related to the output per factory. The study did not investigate how capacity utilization at the farm and factory level would affect the cost of production and returns to the farmers but rather concentrated on the effects of liberalization.

Oluoch (1978) did a research on labour utilization in tea smallholder sector in Kenya due to its rapid growth. He did not find any labour constraints in tea production but recommended further research due to the high rate of growth of the sub-sector. However, this study did not address any capacity utilization at the factory production level.

Oluoko (1999) did a research on the aspects of smallholder tea production in Belgut division of Kericho District to establish social-economic factors influencing smallholder tea production. The study recommended the intervention of GOK and KTDA to develop a policy to address the problems facing the small scale tea farmers. The study did not address the issue of capacity utilization at the factory level.

The above studies therefore indicate there was an urgent need to research in capacity utilization at the factory level given the important role that the factory operations play towards improving the returns of factories or the small scale tea farmers (shareholders). It was also evident that very little research has been done in this field and this gap needs to be filled.

1.3 Research Objectives

The objectives of this study were:

i) To establish capacity utilization of KTDA factories in Kenya.

ii) To establish how capacity utilization affects the quality of tea in KTDA factories

iii) To establish how capacity utilization affects the returns to KTDA factories

1.4 Value of the Study

The study will help in establishing the relationship between capacity utilization, quality tea and returns to KTDA tea factories and whether the relationship is positive. Kenyan economy majorly depends on agriculture and the tea industry contributes 4% of the country's GDP and more than 20% of total foreign exchange and therefore tea is a very important component in Kenya's economy. About 4 million people in Kenya depend on tea out of which over 560,000 are small scale tea farmers under KTDA and whose contribution is over 60% of the tea produced in the country. These small scale farmers are found in the rural areas and directly depend on the crop. A lot of challenges have been encountered in the past on capacity utilization with some factories suffering excess capacities while others suffer from under capacities. This study will therefore help in formulation of a policy on factory operations in regard to capacity utilization in order to reduce the cost of production in the tea factories. This will therefore be of great benefit to KTDA,GOK and the tea farmers. The findings will also add to the existing body of knowledge.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter discusses the performance of the tea industry in Kenya and studies that relate to capacity utilization and their importance in economic development. The focus is more on past related studies and theories that are important to this particular research.

2.1.1 Tea Industry Structure in Kenya

The diagram in Appendix II shows the key institutions that constitute the tea industry in Kenya. The Ministry of Agriculture (MOA) has the mandate to promote and facilitate production of food and agricultural raw materials for food security and incomes; advance agro-based industries and agricultural exports; and enhance sustainable use of land resources as a basis for agricultural enterprises. The Tea Board of Kenya (TBK), regulates the tea industry in all aspects of tea growing, research, manufacture, trade and promotion in both the local and the international markets. The Board also disseminates information relating to tea and advises the Government on all policy matters regarding the tea industry. Currently the Tea Board of Kenya is functioning as a Tea Directorate under AFFA in the Ministry of Agriculture. Tea Research Foundation of Kenya (TRFK), currently called Tea Research Institute(TRI) under Kenya Agricultural and Livestock Research Organization(KARLO) is the technical arm of the Tea Directorate and has a mandate to carry out research on tea and advise growers on the control of pests and diseases, improvement of planting material, general husbandry, yields and quality. The Foundation has so far developed and released to growers over 45 well-adapted clones.

Kenya Tea Development Agency (KTDA) Ltd, currently manages 66 tea factories in the smallholder tea sub-sector serving over 560,000 growers. Kenya Tea Growers

Association (KTGA) was established by large-scale tea producers to promote the common interests of the members in the cultivation and manufacture of tea and to promote good industrial relations and sound wage policies for the workers. The plantation sub-sector maintains 39 tea factories while Nyayo Tea Zones Development Corporation (NTZDC**),** is a State Corporation established in 1986 to create and manage tea buffer belts around gazetted natural forests to protect them from human encroachment and owns one tea factory.

East African Tea Trade Association (EATTA) brings together tea Producers, Brokers, Buyers and Packers and is the auspices under which the Mombasa Tea Auction is conducted. It has 10 member countries from Eastern and central Africa namely; Kenya, Uganda, Tanzania, Rwanda, Burundi, Malawi, Mozambique, DRC Congo, Ethiopia and Madagascar.

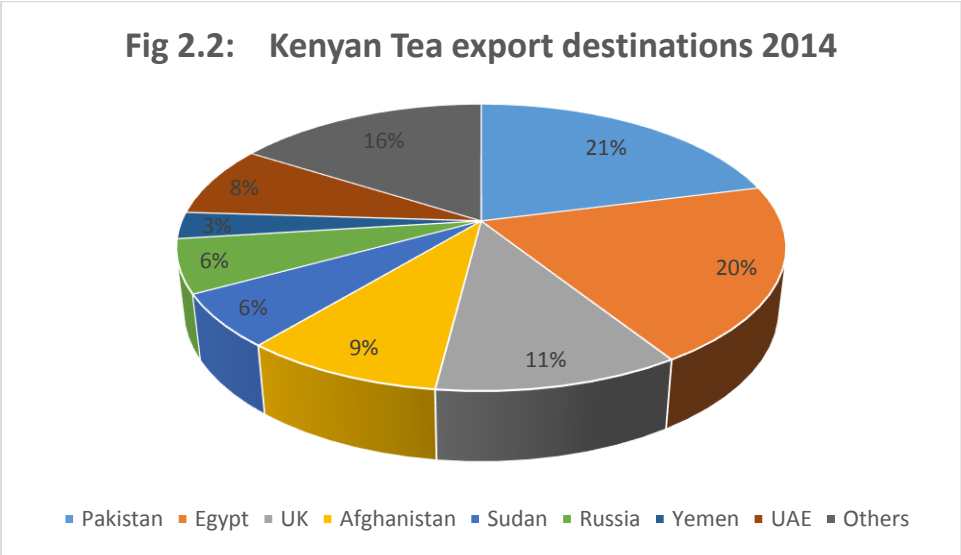
2.1.2 Tea production

The Tea industry has experienced rapid growth in planted area, production and exports, with tea planting increasing from about 147,080 hectares in 2004 to more than 149,000 hectares in 2013. During the same period the annual tea production has increased from 328.2 million kilograms to 432.2 million kilograms as illustrated in fig 2.1 (TBK report, 2014). The challenge that has been facing the tea industry in Kenya in the last decade is that the production has been growing at a higher rate than the world demand and the growth of the local consumption is low as illustrated by figure 2.4, Appendixes III, IV and V.

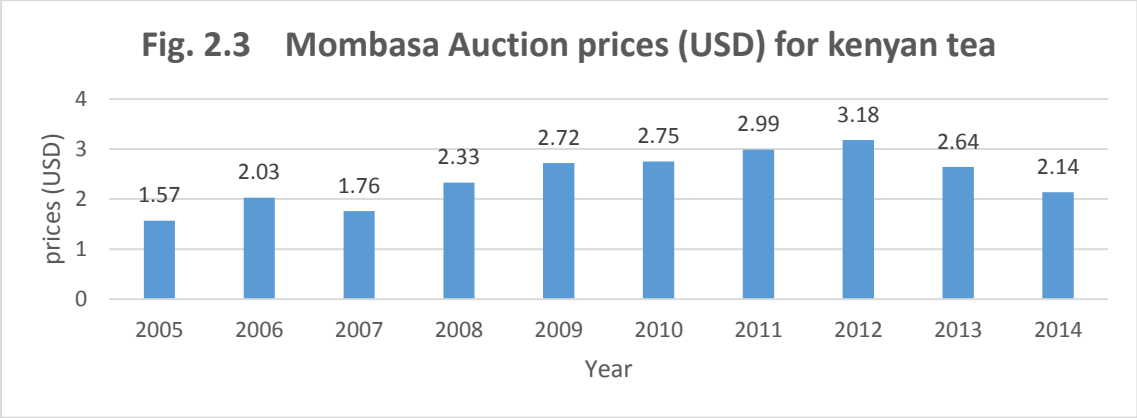
Source: TBK

2.1.3 Tea Marketing

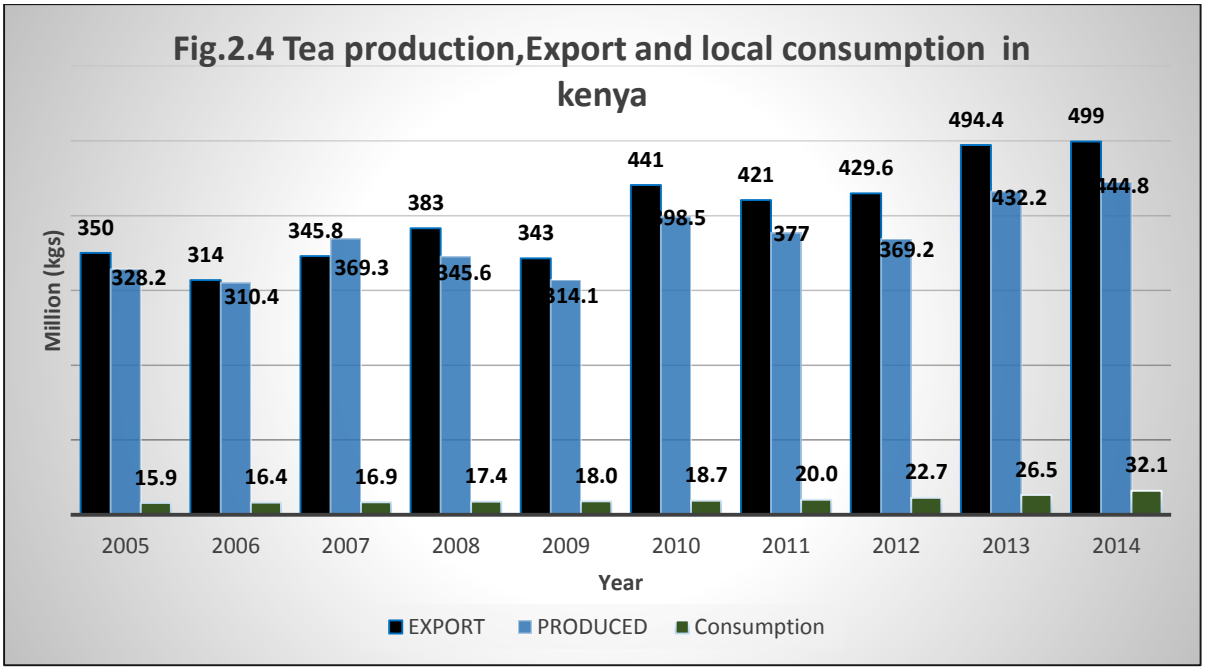
About 93% of the tea produced in Kenya is exported while the remaining balance of 7% is consumed locally (Fig.2.4). Most of this tea is exported in bulk and only a small percentage is packaged for export. About 10% of the total tea production is exported by producers, directly through private arrangements with tea importers across the world (ITC bulletin of statistics, 2013) while the balance is sold through Mombasa auction which the biggest black CTC tea auction market in the world. Pakistan is the leading export market for Kenya, followed by Egypt, United Kingdom, Afghanistan and Sudan. These five countries account for over 65% of Kenyan tea exports (Fig 2.2).



Source: Africa Tea Brokers Ltd



Source: T.B.K



Source: TBK

The variance noted between production and export in Kenya (Fig 2.4) is due to tea imports for blending purposes which are eventually exported.

A number of institutions are involved in tea promotion and marketing namely, Tea Board of Kenya, KTDA, Export Promotion Council (EPC) and individual companies

dealing in tea. There are a number of companies who buy and package tea into their own brands for which they undertake individual promotion activities both in the local and export markets. These include Unilever Kenya Ltd, James Finlay (Kenya) Ltd and George Williamson Tea Kenya Ltd.

The Tea Board of Kenya is responsible for regulating tea trade and promotion in both the local and the international markets. In the past 10 years the Board promotion activities have targeted West Africa, Eastern Europe and Middle East. The Export Promotion Council, which has an overall mandate in export promotion and development activities in the country, has been instrumental in promoting tea in different countries. The Council's trade promotion activities target all Kenyan exportable products and tea has benefited from the Council's promotion activities not only in the traditional markets of the European Union (EU) and the Middle East but also in USA, Eastern Europe and Africa especially Egypt, Sudan and South Africa.

There are several challenges facing the tea industry in Kenya today but the main challenge is the increasing cost of production (Miano, 2010) and the declining tea prices in the international market (fig.2.3). About 93% of tea production is exported, almost all in bulk with no value addition (TBK, 2013) is a major loss in revenue. Overreliance on traditional export markets which consume over 65% of Kenya's tea export (fig.2.2) and low local tea consumption, currently averaging at 7% (fig.2.4) pose a major threat if the export market were to collapse. There is evidence that annual production is increasing (fig.2.1) contributing to oversupply of black C.T.C tea in the world market. In this research the focus was on utilization of available KTDA factory capacity and how it affects quality of tea and factory returns in an effort to further improve the earnings of the shareholder (small scale tea farmer).

2.2 Theoretical Review

This section gives a set propositions under which the study is anchored in an attempt to provide a plausible or rational explanation of cause-and-effect (causal) relationships among the study variables. The study is specifically hinged on the constraint theory, quality theory, theory of diminishing returns and also the economies and diseconomies of scale

2.2.1 Constraint Theory

Theory of Constraints (TOC) was created by Dr Eli Goldratt and was published in his book "The Goal." in 1984.It provides a set of holistic processes and rules, all based on a systems approach that exploits the inherent simplicity within complex systems through focusing on the few "leverage points" as a way to synchronize the parts to achieve ongoing improvement in the performance of the system as a whole. The whole concept behind this theory is to manage the weakest link as a chain is as strong as its weakest link. In any industry, there is often scope for boosting overall performance and the greatest way in achieving this is to identify and eliminate "bottlenecks," or things that are holding you back. The Theory of Constraints (TOC) helps to identify the most important bottleneck in processes and systems, in order to manage it and improve performance (Golgratt, 1984).

According to Goldratt (1984), organizational performance is dictated by constraints. These are restrictions that prevent an organization from maximizing its performance and reaching its goals. Constraints can involve people, supplies, information, equipment, or even policies, and can be internal or external to an organization.

The theory states that in every system, no matter how well it performs, has at least one constraint that limits its performance – this is the system's "weakest link." The theory

also states that a system can have only one constraint at a time, and that other areas of weakness are "non-constraints" until they become the weakest link. The theory was originally used successfully in manufacturing, but today it used in a variety of situations. Nyaoga, Wang and Magutu (2015) in their research on capacity utilization and value chain indicate that key theoretical perspectives of TOC have greatly been used in supply chain management studies. The theory is relevant in this research since it can be used in identifying bottlenecks that limit capacity utilization in tea processing factories.

2.2.2 Quality Theory

The Juran Trilogy, published in 1986, identified and was accepted worldwide as the basis for quality management. After almost 50 years of research, his trilogy defined three management processes required by all organizations to improve. Quality control, quality improvement, and quality planning. These have become synonymous with Juran and Juran Institute.

Juran describes quality from the customer perspective as having two aspects: higher quality means a greater number of features that meet customers' needs. The second aspect relates to "freedom from trouble"; higher quality consists of fewer defects. In summary Juran (1986) described quality as "fitness for purpose or use". Quality of tea is the most important factor in determination of prices in the tea auction. The tea buyer looks at the whole aspect of tea quality, that is, leaf appearance, infusion and liquor to value a specific tea. This explains why different factories get different prices for their teas by the same buyer under the same auction conditions or why different invoices from the same factory attract different bids in the same auction. This is all based on the quality as viewed by the customer, in this case the tea buyer.

2.2.3 Theory of Diminishing Returns

The law of diminishing returns is an empirical law and applies in various production activities. The theory may not apply universally to all kinds of productive activities. It will operate faster in some production activities than others. This have been found to operate in agricultural production more regularly than in industrial production because in agriculture, natural factors play a predominant role whereas man made factors play a major role in industrial production. However, despite these limitations, the marginal returns to a variable input eventually decreases by increasing the units of the input to a fixed factor of production (Kunwar & Nyandemo, 2007). This relates very well to the concept of optimum capacity utilization in a tea processing factory at the point where the minimum cost of production is achieved.

2.2.4 Economies and Diseconomies of Scale

Economies of scale result in cost saving and diseconomies lead to rise in cost. This is classified into Internal and external economies of scale.

Conceptually, the optimum size of a firm is the one which ensures the most efficient utilization of resources. Practically, the optimum size of a firm is the one that minimises the long average curve (LAC). At a given level of technology there is technically a unique size of the firm and level of output associated to the least cost concept (Dwivedi, 2008). In this study emphasis is made on the utilization of internal economies of the tea processing factories particularly their available technology and capacity.

2.3 Empirical Studies

There are two approaches to measuring capacity utilization. The first approach measures capacity utilization using an estimated cost function. Another approach uses Federal Resource Board (FRB) or Wharton measure that investigates the

macroeconomic implications of high or low capacity utilization. Sarbapriya (2013) observed that very little research work has been undertaken on economic measurement of capacity utilization since most of the studies on capacity utilization had used conventional methods and had paid less attention to the possible theoretical problems. Therefore, there was a need to have a study to extend the concept of capacity utilization beyond conventional methods and build up some new theory.

Nyaoga,Wang and Magutu (2015) did a research with an objective to determine the relationship between capacity utilization and value chain performance of tea processing firms in Kenya. A sample of 85 tea processing factories was used with only 44 of the total responding giving a response rate of 51.8%. The results indicated a very strong positive relationship between capacity utilization and value chain performance in tea processing factories. The empirical evidence indicated that firms should invest more in effective capacity utilization through enhanced levels of outputs compared to the designed capacity in order to improve the throughput and value chain performance. The study also clears the contradictions by Guy et al. (2005) whose study on the impact of application of the Theory of Constraints in the health sector indicated a negative relation where the increase of patients in the outpatient section increased with no actual value addition.

Sarbapriya (2013) in his research work in analysing capacity utilization studies on capacity in India and other countries found out that no comprehensive studies on capacity utilization existed for India which are based on economic notion of capacity whose coverage is comprehensive in terms of period of the study as well as coverage of the industrial sectors. Earlier studies on capacity utilization had left unaddressed several theoretical and data problems in measuring capacity utilization. This is not different for Kenya and more so in the tea industry.

Shahidul, et al (2013) did a research to measure machinery capacity utilization and its impact on manufacturing performance and environment in plastic manufacturing industry. The main objectives was to evaluate the impact of CU on efficiency of machinery and the impact the CU has on wastage and environmental sustainability. It was observed that CU and production efficiency are positively related. This is because during the production process inputs are transformed into outputs at higher rates. It was also noted that lower level of CU could produce poor quality products which could lead to low production efficiency and higher degree of waste. In summary the observation was that the optimization of capacity utilization of machinery is essentially important for achieving sustainable production performance and environment. It was also further observed that CU is negatively correlated with waste of inputs namely raw materials and final products. The study further recommends for further in-depth study in other relevant industries.

Iraki (2013) in his research paper entitled "The Forgotten Secret in Trading Out Poverty" identified capacity utilization as a catalyst which can enhance faster economic growth of a country. He refers to earlier studies done by Levine and Renelt (1992) which indicate that the variables most closely related to growth are trade and investment; but Frankel and Romer (1999) suggested that a third factor may be at play; however, they did not identify this third factor. Iraki (2013) identifies this factor as capacity utilization and emphasis the need to fully utilize the existing capacity in terms of facilities, machinery and personnel to foster economic development. The study also indicates that there was not available data from the Eastern African countries which suggests that there is need for more research in the region to provide the necessary data in future.

Kathata (2011) did a research on factors affecting the quality of tea in KTDA factories in Thika district. The research looked at the increasing tea production and declining tea

returns to the farmers and concluded that the focus should be on quality other than the quantity of tea. He noted that the cost of production is also on the rise. However, the study focused on quality and how it can be used to improve factory returns but did not address factory capacity utilization as a possible solution to improving the returns.

It is against this backgound that I undertook this research to bridge the identified gaps in capacity utilization and its effect on quality of tea and returns to the tea factories more specifically in the KTDA factories in Kenya.

2.4 Summary of literature Review

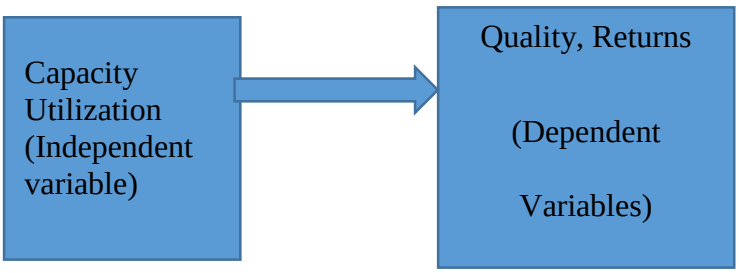
From the studies discussed, capacity utilization is a key factor for economic development of a nation. There exists a very huge unutilized capacity in all sectors and countries including developed economies like America and more research is required especially in East Africa Countries (Iraki, 2013). There is very little research that has been done on capacity utilization in tea industry in Africa and more specifically in Kenya and yet there are many challenges facing the tea industry in Kenya today.

It is against this background that more research was needed to establish the level of capacity utilization of tea factories and how it affects the quality of tea and factory returns. For the purpose of this research, KTDA factories for small scale tea farmers in Kenya were used.

2.5 Conceptual Framework

The conceptual framework looks at how the different variables relate with each other. Fig.5 below shows how the dependent variables, quality and returns vary with capacity utilization which is the independent variable. The established relationship between the three variables are discussed in Chapter 4 and 5.

Figure 2.5: Relationship between Variables.



CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the research design, the target population, the basis of the sample selection, data collection, the techniques of data analysis used and data analysis procedure.

3.2 Research Design

The research adopted a descriptive design. The design was chosen since it is concerned with determining the frequency with which something occurs or the relationship between variables (Bryman and Bell, 2007). In addition, the design is preferred because it enables assessing relationships between variables (Tashakkori & Teddlie, 2003) and enables large and diverse amounts of data to be collected within a short time frame and analyzed quantitatively, giving a credible presentation of results (Singleton, 2009).

3.3 Target Population

The target population refers to the entire group of elements that possess information that the research is interested in. The target population for this research was KTDA tea factories in Kenya. There are 66 tea factories under KTDA, 12 of which are subsidiaries and the study therefore focused on 54 factories. A census approach was undertaken to ensure adequate information is obtained for the study since the population is not big. The information was mainly obtained from the Factory Unit Managers who are the overall in-charge of the factories.

3.4 Data Collection

Secondary data was collected from the respective Factories, Regional office, KTDA Head Office for the period 2009/2010 to 2014/2015. In addition a structured questionnaire was also used to collect data and information on factory capacity.

3.5 Data Analysis

Data was analyzed using Statistical Package for Social Sciences (SPSS Version 21.0). All the questionnaires received were referenced and items in the questionnaire coded to facilitate data entry. After data cleaning which entailed checking for errors in entry, descriptive statistics such as frequencies, percentages, mean score and standard deviation were estimated for all the quantitative variables to achieve the first objective. Descriptive statistics was used because they enable the researcher to meaningfully describe distribution of scores or measurements using few indices (Mugenda & Mugenda, 2003). The qualitative data from the open ended questions was analyzed using conceptual content analysis. The information presented inform of frequency tables and graphs for easy understanding and interpretation of the results.

For the second and third objectives, inferential data analysis was done using multiple regression analysis to establish the relationship between the variables. The regression equation used was as follows:

$$\boldsymbol{CU = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + €}$$

Where: **CU** was capacity utilization (CU= actual Output/Installed capacity, weighted average for 6yrs was used for each factory), β_0 is a constant, β_1, β_2 were coefficients of determination, $\mathbf{X_1}$ was return to the farmer, (monthly plus bonus payments in the year, weighted average for 6yrs was used for each factory), $\mathbf{X_2}$ was quality index (measure was the average auction tea prices in a year, weighted average for 6yrs was used to get quality index for each factory) and $\boldsymbol{€}$ was error term. The coefficient of determination (R^2) were used to measure the extent to which the variation in returns was explained by the variations in the independent variables. F-statistic was computed at 95% confidence level to test whether there was any significant relationship between the variables.

Capacity utilization was obtained by using the actual capacity utilized in a given year divided by the installed capacity of each specific factory as follows:

CU=AO/DC where CU was the capacity utilization for the factory, AO was actual output of the factory per year while DC was the designed (installed) capacity for the factory. DC was calculated by applying Theory of Constraint (TOC) in the most critical sections in tea processing for 8760 hours in a year. The most critical sections were found to be withering, cutting, fermentation and drying. To arrive at more realistic CU for a specific factory, a period of 6 years (2009/10 to 2014/15) was considered and a weighted average calculated. The following equation was used,

$$CU_y = (\sum_{t=1}^{6} AO_{yt})/6DC$$

Where CU_y was capacity utilization for factory y, t was period (t=1 is 2009/10,……,t=6 is 2014/15), AO was actual output and DC was designed capacity.

The weighted average represented the capacity utilization for a specific factory. This was calculated for all the factories. Each factory therefore represented a specific level of capacity utilization.

The rate of return to the farmer (X_1) per factory was obtained by adding up the total payments for 6 years and a weighted average rate per kilogram of tea obtained as follows: $X_1y = \frac{\text{Total farmers payment in 6yrs}}{\text{Total production in 6yrs}}$

Where, X_{1y} is total average rate of return for farmers in factory y, t is period (year). This was done for all the factories. A graph to show how returns varied in relation to capacity utilization was done.

Tea quality index was established by using a proxy indicator of the tea auction prices and average obtained by the following equation, $X_{2y} = (\sum_{t=1}^{6} X_{2yt})/6$

Where,X_{2y} is tea quality index for factory y, t is period (year). This was done for all the factories. A graph to show how tea quality index varied with capacity utilization was done. Some graphical analysis showing the relationship between the capacity utilization vis a vis quality and returns was also done and is presented in the next chapter.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter presents analysis and findings of the study as set out in the research objectives in chapter one under 1.3. The study findings represent the effects of capacity utilization, quality of tea and returns to KTDA factories in Kenya. The data was collected from the respective factory, Regional offices and KTDA Head Office for the period 2009/2010 to 2014/15

4.2 Response Rate

The total population was made up of 54 KTDA factories in Kenya. Out of the 54 companies, 31 factories responded to the questionnaires making a response rate of 57.4%. According to Mugenda and Mugenda (1999), a response rate of 50% is adequate for analysis and reporting. Kothari (2004) gives response rate of 50% as adequate, while a response rate greater than 70% is very good. This means that the response rate for this study was adequate and therefore enough for data analysis and interpretation.

Table 4.1: Descriptive Statistics

	N	**Minimum**	**Maximum**	**Mean**	**Std. Deviation**
capacity utilization	31	18%	58%	38.92%	0.09055
Returns	31	1.90	2.94	2.3848	0.29050
Quality	31	2.64	3.24	2.9574	0.17761

Returns in USD per Kg of tea.

From the findings in table 4.1 above, the average rate of capacity utilization of KTDA factories in Kenya was 38.92%. Although this meets the objective of the study 1.3(i) in chapter one, the findings depict low capacity utilization in KTDA factories of 38.92%. This can be explained by the fact that supply of the raw material (green leaf) which is the main input in tea processing is seasonal and dependant on weather. Capacity utilization is the actual output expressed as a percentage of potential output or designed capacity. Capacity utilization of 38.92% would imply that, on average a KTDA factory operating at full capacity subject to TOC utilizes about 9 hrs, 20 minutes every day in full a year (365days). From calculations based on the data provided from the factories, the average return was 2.3848 (USD) per Kg. while average quality index was 2.9574.

Figure 4.1: Capacity utilization and Quality

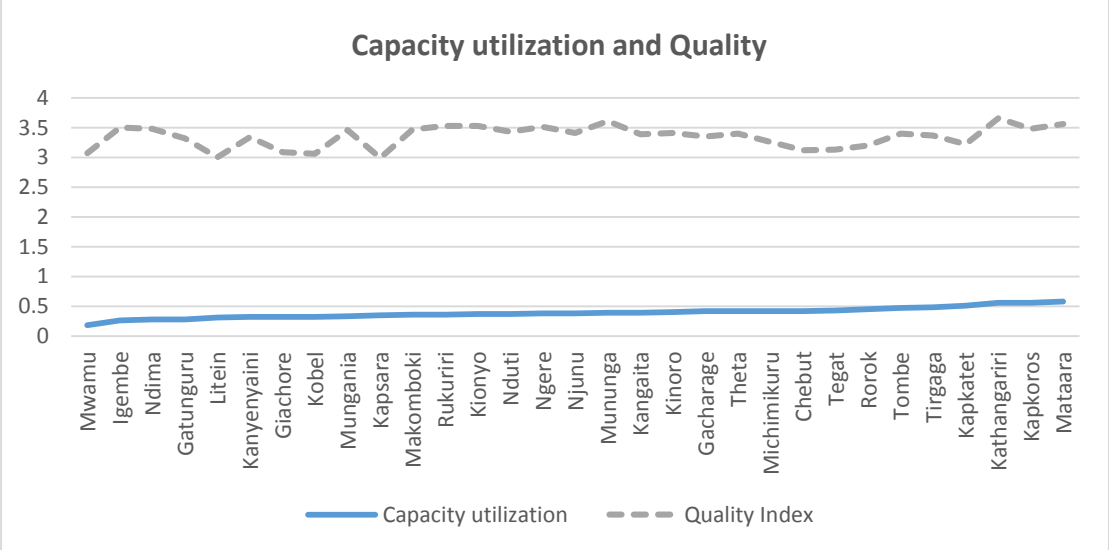
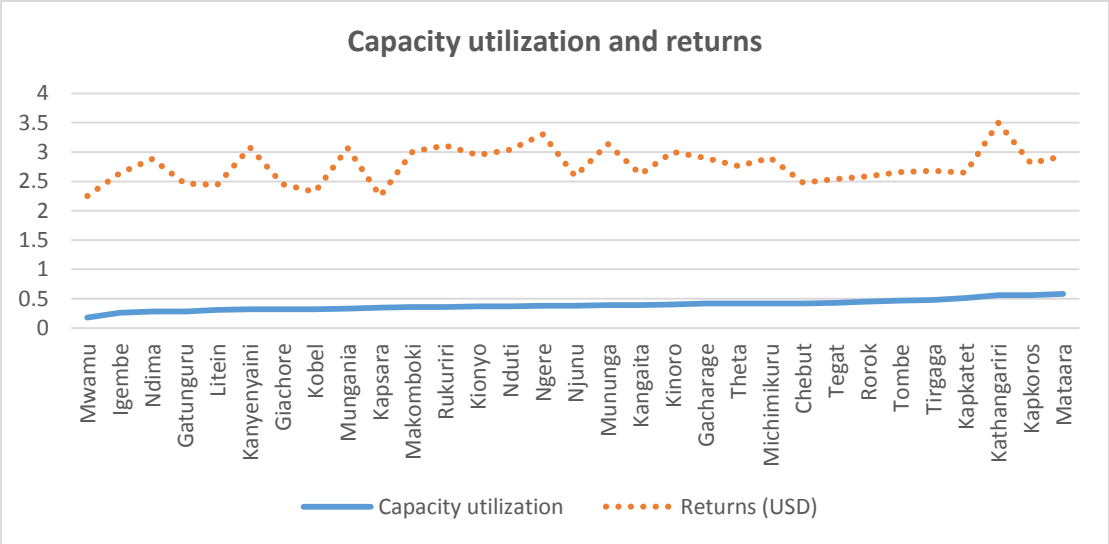


Figure 4.1 above shows the relationship between capacity utilization and quality as per objective 1.3(ii) in chapter one. The study reveals that in KTDA factories in Kenya, an increase in capacity utilization results in a slight increase in quality. However it was established that in some factories the relationship between the two variables was inversely related and an increase in capacity utilization meant a decrease in quality.

The relationship between the two variables is further analyzed using Correlation Analysis which gave a positive relation as per Table 4.2 below.

Figure 4.2: Capacity utilization and returns



The findings in figure 4.2 above shows the relationship between capacity utilization and returns as per the objective 1.3(iii) in chapter one. The study reveals that in KTDA factories in Kenya when capacity utilization increases, returns on the other hand also increases. This relationship was analyzed further using Correlation Analysis which gave a positive relation as per Table 4.2 below.

Figure 4.3: Capacity utilization, returns and Quality

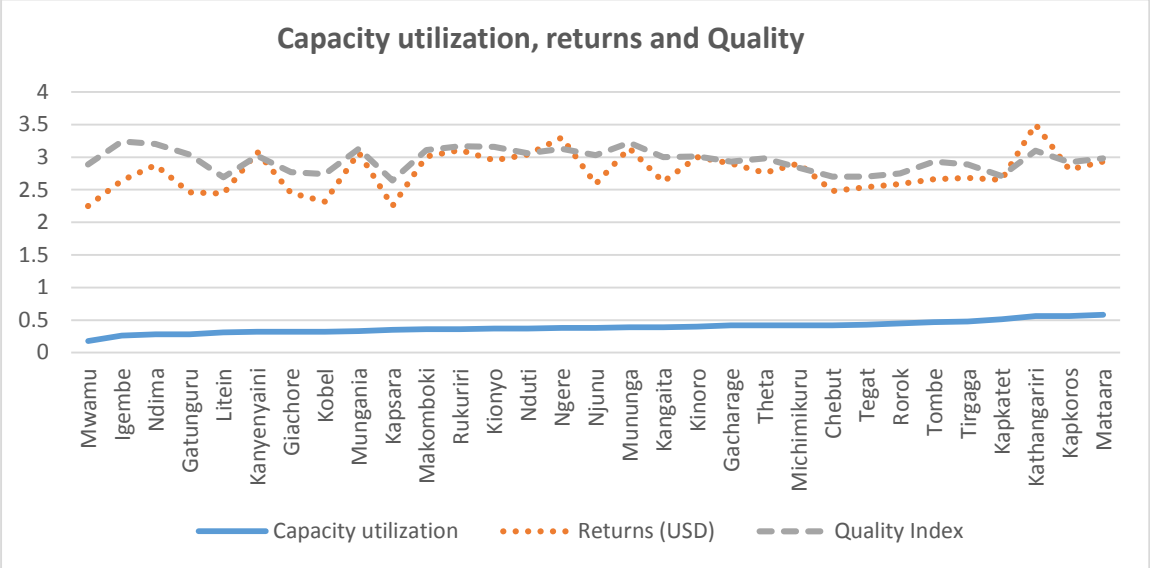


Figure 4.3 above shows the relationship between the three variables, capacity utilization, returns and quality.

4.3 Correlation Analysis

The study used Karl Pearson's coefficient of correlation in order to quantify the strength of the relationship between the variables. The Pearson product-moment correlation coefficient determines the strength of a linear association between two variables and is denoted by *r* which can take a range of values from +1 to -1. A value of 0 indicates that there is no association between the two variables. A value greater than 0 indicates a positive association, that is, as the value of one variable increases so does the value of the other variable. A value less than 0 indicates a negative association, that is, as the value of one variable increases the value of the other variable decreases.

The Pearson's coefficient was used to verify the existence or non-existence of linear correlation between and among the capacity utilization with returns and quality. The findings are presented as follows;

Table 4.2: Correlation Analysis

		capacity utilization	returns	quality
capacity utilization	Pearson Correlation	1	0.765*	0.439*
	Sig. (2-tailed)		0.047	0.015
	N	31	31	31
Returns	Pearson Correlation	0.765*	1	0.199
	Sig. (2-tailed)	0.047		0.293
	N	31	30	30
Quality	Pearson Correlation	0.439*	0.199	1
	Sig. (2-tailed)	0.015	0.293	
	N	31	31	31

*. Correlation is significant at the 0.05 level (2-tailed).

Results from table 4.2 above reveal that there is a significant positive relationship between capacity utilizationand returns (r= .765, P-value < 0.05). This implies that capacity utilization influences returns at KTDA factories in Kenya.

The findings also disclosed a significant positive relationship between capacity utilization and quality (r = .439**, P-value < 0.01). Thus, implying that capacity utilization influences quality at KTDA factories in Kenya

The above findings collaborate with Shahidul and Shazali (2011) findings who noted that the degree of CU is a manufacturing performance indicator; and CU growth rate is

positively associated with manufacturing productivity. Practically, productivity growth is measured and adjusted with CU for maintaining sustainable industrial growth. Productivity growth is also realized by reducing non-value added inputs and maximizing output. It is because underutilized capacity creates capacity gap and capacity gap acts as non-value added input which contributed to reduce productivity.

4.4 Regression Analysis

This was used to further establish the relationship of the three variables, that is, capacity utilization, quality of tea and returns in KTDA factories. However, the data was not tested for normality, heteroscedasticity and multicollinearity.

4.4.1 Model Summary

The coefficient of determination (R Square) is used to test the goodness-of-fit of the model. That is, R Square measures the proportion or percentage of the total variation in the dependent variable explained by the independent variable. The value of R Square lie between 0 and 1 and if R Square value is 1, then there is a perfect fit while R Square value 0 indicates that there is no relationship between dependent and independent variables. The capacity utilization, explain only 27.4% of the returns and quality at KTDA factories in Kenya as represented by the R^2. This therefore means that other factors affecting returns and quality at KTDA factories in Kenya not studied in this research add up to 72.6%. Such other factors might include technology of machinery used in factories, age of the factory and machinery which will affect the quality of tea and returns to the KTDA factories. Also, the time lag between plucking of green leaf (raw material) to manufacture and eventual delivery of tea to the auction might affect the quality of tea resulting into low prices and low returns.

Table 4.3: Coefficient of Determinants

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.523[a]	0.274	0.220	0.09319

Source: Research Data (2015)

Table 4.4: ANOVA Results

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	0.006	2	0.003	5.083	0.013[b]
	Residual	0.01652	28	0.00059		
	Total	0.02252	30			

The probability value (p-value) of a statistical hypothesis test is the probability of getting a value of the test statistic as extreme as or more extreme than that observed by chance alone, if the null hypothesis H_0 is true. The p-value is compared with the actual significance level of the test and, if it is smaller, the result is significant.

The significance value is 0.013 which is less than 0.05 shows the model is statistically significance in predicting the relationship between capacity utilization, returns and quality at KTDA factories in Kenya.

Table 4.5: Analysis of Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.359	0.183		1.961	0.060
	Returns	0.601	0.283	0.289	2.120	0.045
	Quality	0.013	0.005	0.382	2.282	0.031

Multiple regression analysis was conducted as to determine capacity utilization, quality of tea and returns to KTDA factories in Kenya. As per the SPSS generated table above, the equation ($CU = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + €$) becomes:

CU=0.359+ $\beta_1$0.601+ $\beta_2$0.013+ **€**

Whereby

CU represents capacity utilization,

β0 is a constant term,

X_1- Returns

X_2- Quality

4.8 Summary and Interpretations of Findings

The study reveals that in KTDA factories in Kenya when capacity utilization increases returns on the other hand also increases. The study also established that there is positive relationship between capacity utilization and quality. However the relationship between capacity utilization and returns is positively stronger than that of capacity utilization

and quality. In line with the findings, Nyaoga, Wang and Magutu (2015) did a research with an objective to determine the relationship between capacity utilization and value chain performance of tea processing firms in Kenya. The results indicated a very strong positive relationship between capacity utilization and value chain performance in tea processing factories in Kenya. The empirical evidence indicated that firms should invest more in effective capacity utilization through enhanced levels of outputs compared to the designed capacity in order to improve the throughput and value chain performance. Also in collaboration with the findings, Shahidul, et al. (2013) did a research to measure machinery capacity utilization and its impact on manufacturing performance and environment in plastic manufacturing industry. The main objectives were to evaluate the impact of CU on efficiency of machinery and the impact the CU has on wastage and environmental sustainability. It was observed that CU and production efficiency are positively related. This is because during the production process inputs are transformed into outputs at higher rates. It was also noted that lower level of CU could produce poor quality products which could lead to low production efficiency and higher degree of waste. In summary the observation was that the optimization of capacity utilization of machinery is essentially important for achieving sustainable production performance and environment.

According to the regression equation established, taking all factors into account (returns and quality) constant at zero, capacity utilization rating would be 0.359. The data findings analysed also shows that taking Quality at zero, a unit increase in capacity utilization will lead to a 0.601 increase in Returns; while a unit increase in capacity utilization will lead to a 0.013 increase in quality. This infers that capacity utilization contributes the most to the returns in KTDA factories in Kenya. The study reveals that in KTDA factories in Kenya when capacity utilization increases returns on the other

hand also increases. There is also positive relationship between capacity utilization and quality. Similar to the findings, Guy et al. (2005) did a study on impact of application of Theory of Constraint in the health sector and found out that the number of patients in outpatient increased but there was no actual value addition, the reason might have been on issues to do with capacity.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATION

5.1 Introduction

The chapter provides the summary of the findings from chapter four, and it also gives the conclusions and recommendations of the study based on the objectives of the study.

5.2 Summary of the Findings

The study established that there was low capacity utilization in KTDA factories. This was mainly attributed to unreliable supply of the raw material (green leaf) which is dependent on weather leading to idle capacity in KTDA factories.

The study established that there was a significant positive relationship between capacity utilization and quality and also a significant positive relationship between capacity utilization and returns in KTDA factories. It was further established that the relationship between capacity utilization and returns was much stronger compared to the relationship between capacity utilization and quality.

5.3 Conclusions

In relation to the objective of the study on establishing the capacity utilization in KTDA factories, the study concludes that, KTDA factories are operating at a low capacity utilization of 38.92%. In relation to the objective of the study on the effect of capacity utilization and returns, it was found out that there is a significant positive relationship between capacity utilization and returns to KTDA factories

In addition and in relation to the objective of the study on the effect of capacity utilization on the quality of tea in KTDA factories, the findings conclude there is a significant positive relationship between capacity utilization and quality hence capacity utilization influences quality at KTDA factories in Kenya.

The study concludes that taking all factors into account (returns and quality) constant at zero, capacity utilization rating would be 0.359. The study also concludes that taking quality at zero, a unit increase in capacity utilization will lead to a 0.601 increase in returns; while a unit increase in capacity utilization will lead to a 0.013 increase in quality.

5.3 Policy recommendations

The study recommends that factories should improve in utilization of the already installed capacity in order to improve on returns since the study shows that this will not compromise the tea quality. This will directly translate into better payments to the small scale tea farmers. However, it will be prudent to establish the optimum capacity utilization level for every individual factory taking into account the effective capacity since a negative relationship between capacity utilization and quality was observed in a few factories.

The study shows that KTDA management need to focus more in the medium and long term capacity planning in order to improve capacity utilization and factory returns in the long run.

The management should also address the capacity mismatches identified through TOC at different stages along the processing line in order to reduce the overall idle capacity in the factories.

The study recommends that operations managers should do capacity planning in order to match capacity with production for better financial performance of their firms.

Finally, the study recommends more funding by GOK towards tea research in key research institutions like Tea Research Institute and the Universities to develop better

yielding tea clones for the farmers in order to improve the supply of raw material (green leaf) to the factories. This will improve capacity utilization in KTDA factories.

5.4 Limitations of the study

The response rate was low at 57.4% hence making it difficult to generalize the findings to all KTDA factories.

Time constraint was experienced as the amount of time available to collect data was limited. The study used primary and secondary data; the data used may have been kept for other purpose as opposed to this research objective.

5.5 Suggestions for further studies

Future research can use case studies of individual tea processing factories in an effort to determine the relationship between capacity utilization, quality of tea and returns and to validate the findings of this study.

Capacity utilization explains only 27.4% of the returns and quality at KTDA factories in Kenya as represented by the R^2. This therefore means that other factors affecting returns and quality at KTDA factories in Kenya not studied in this research add up to 72.6%. Future research should thus be undertaken to examine the other factors affecting returns and quality at KTDA factories in Kenya.

A research in capacity utilisation is recommended for multinational and other non KTDA tea factories in Kenya for purposes of industry benchmarking.

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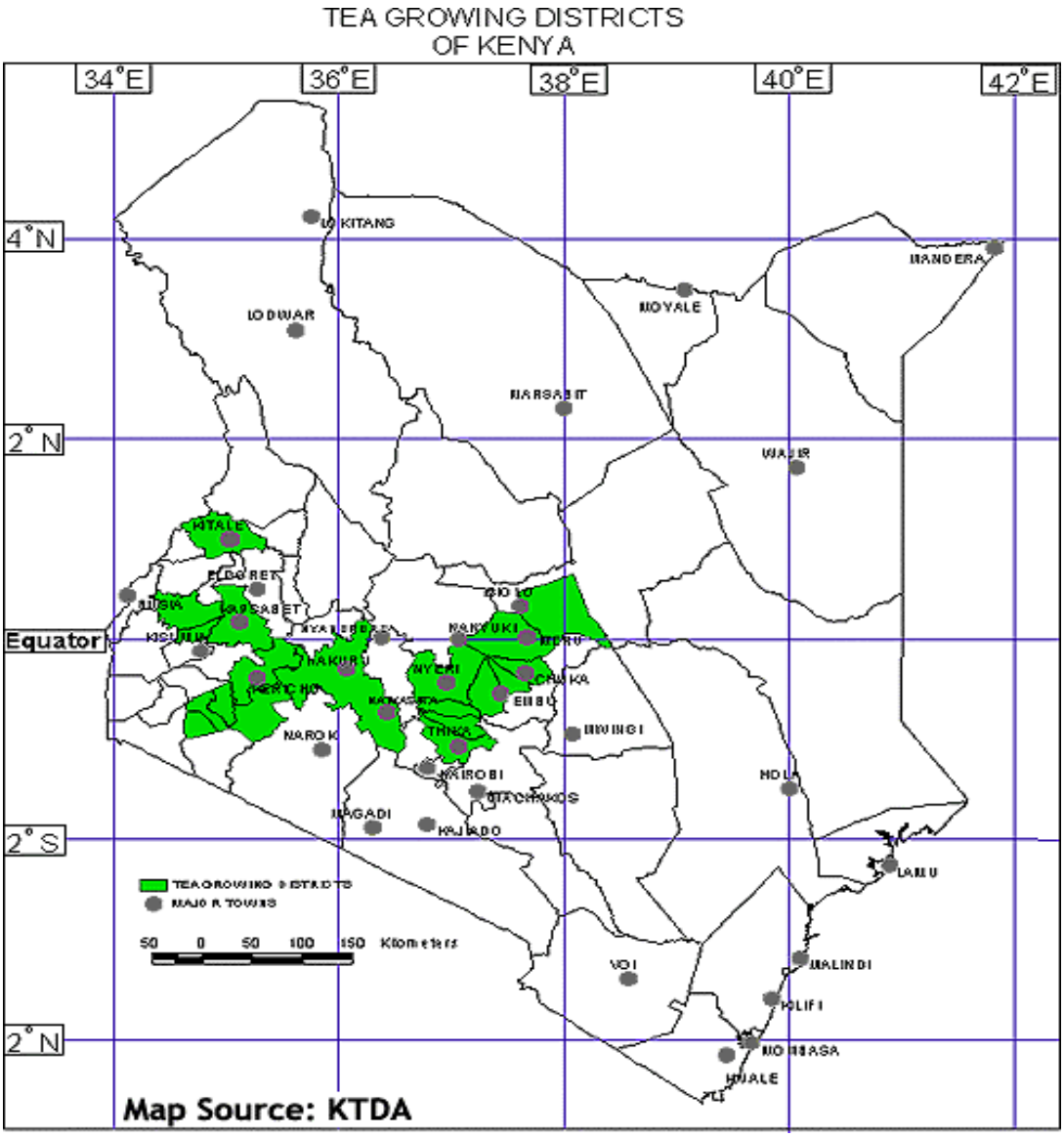
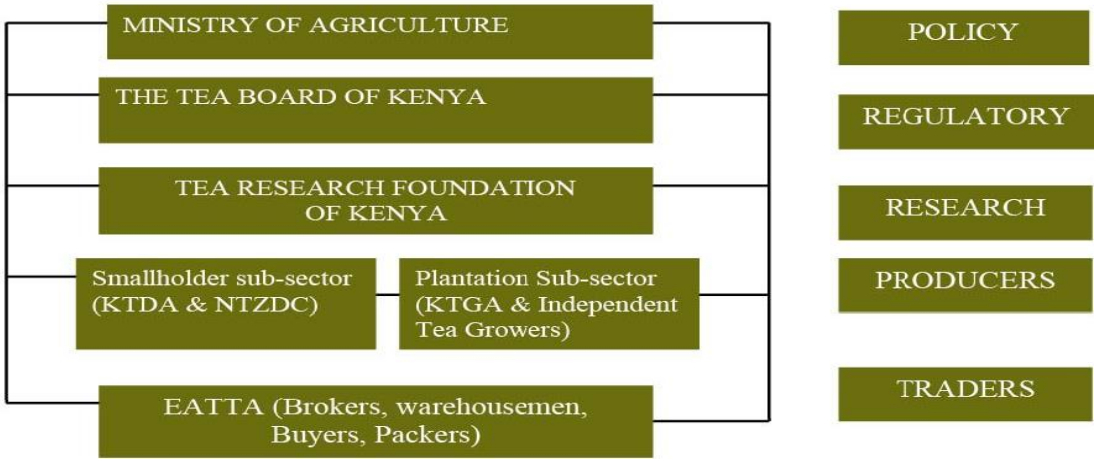
APPENDIXES

Appendix I: Tea Growing Areas in Kenya



Source; KTDA

Appendix II: Tea industry Structure



Source: Tea Baord of Kenya

Appendix: III Ten Year (2004-2013) Production Figures in Million Kgs

Country	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Burundi	7.7	7.8	6.3	6.7	6.4	6.6	6.8	7.0	8.7	8.8
Kenya	324.6	323.5	310.6	369.6	345.8	314.2	399.0	377.9	369.6	432.5
Malawi	50.1	38.0	45.0	48.1	41.6	52.6	51.6	47.1	42.5	46.5
Mozambique	4.7	3.6	3.4	6.2	6.4	6.5	6.5	6.6	6.2	6.4
Rwanda	14.2	16.5	17.0	20.5	20.0	20.5	23.2	24.1	23.1	23.5
Tanzania	30.7	30.4	31.3	34.9	31.6	32.1	31.6	32.8	32.3	32.1
Uganda	35.7	37.7	36.7	44.9	42.8	51.0	59.1	54.2	57.9	61.0

Source : Country Association Data and ITC

Appendix IV: Production of tea by major producing countries in 2012(million Kgs)

Country	2012	% Share in total production
China	1789.75	38.70
India	1126.33	24.36
Kenya	369.56	7.99
Sri Lanka	328.40	7.10
Vietnam	190.00	4.11
Turkey	147.00	3.18
Indonesia	137.25	2.97
Bangladesh	62.16	1.34
Malawi	42.49	0.92
Uganda	57.94	1.25
Tanzania	32.28	0.70
Others	341.47	7.38
Total	**4624.63**	100.00

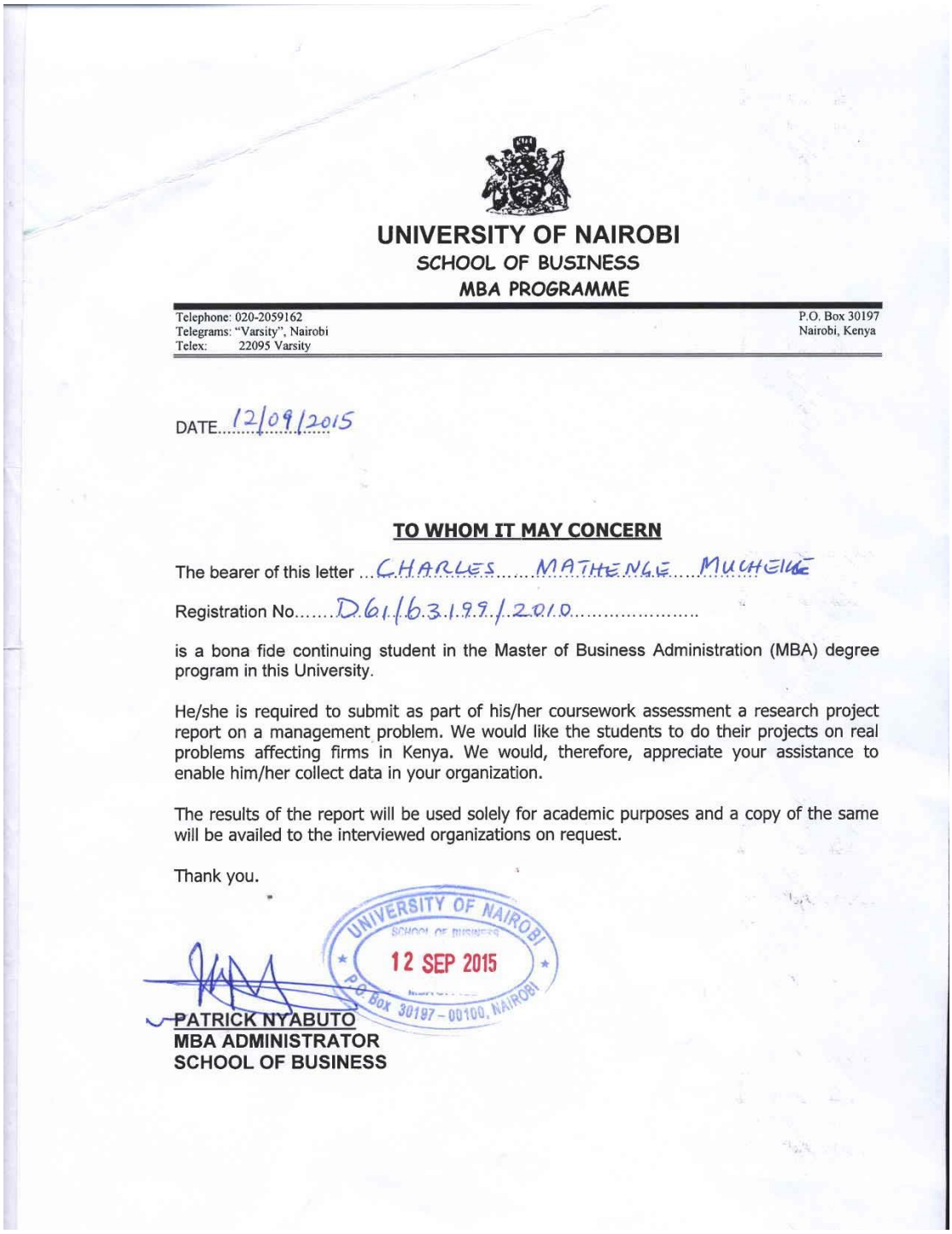
Source: ITC Annual Bulletin 2013

Appendix V: Export of tea by major producing countries in 2012(million Kgs)

Country	2012	% Share in total Exports
Kenya	**430.21**	24.22
China	**321.79**	18.11
Sri Lanka	**306.04**	17.23
India	**208.26**	11.72
Vietnam	**150.00**	8.44
Argentina	**76.84**	4.33
Indonesia	**70.07**	3.94
Uganda	**52.27**	2.94
Malawi	**41.83**	2.35
Tanzania	**27.78**	1.56
Zimbabwe	**8.00**	0.45
Bangladesh	**1.51**	0.08
Others	**81.91**	4.61
Total	**1776.51**	100.00

Source: ITC Annual Bulletin 2013

Appendix VI: Data collection clearance letter from University of Nairobi



UNIVERSITY OF NAIROBI
SCHOOL OF BUSINESS
MBA PROGRAMME

Telephone: 020-2059162
Telegrams: "Varsity", Nairobi
Telex: 22095 Varsity

P.O. Box 30197
Nairobi, Kenya

DATE 12/09/2015

TO WHOM IT MAY CONCERN

The bearer of this letter ... CHARLES MATHENGE MUCHEIRE

Registration No. D.61/6.3.199/2010

is a bona fide continuing student in the Master of Business Administration (MBA) degree program in this University.

He/she is required to submit as part of his/her coursework assessment a research project report on a management problem. We would like the students to do their projects on real problems affecting firms in Kenya. We would, therefore, appreciate your assistance to enable him/her collect data in your organization.

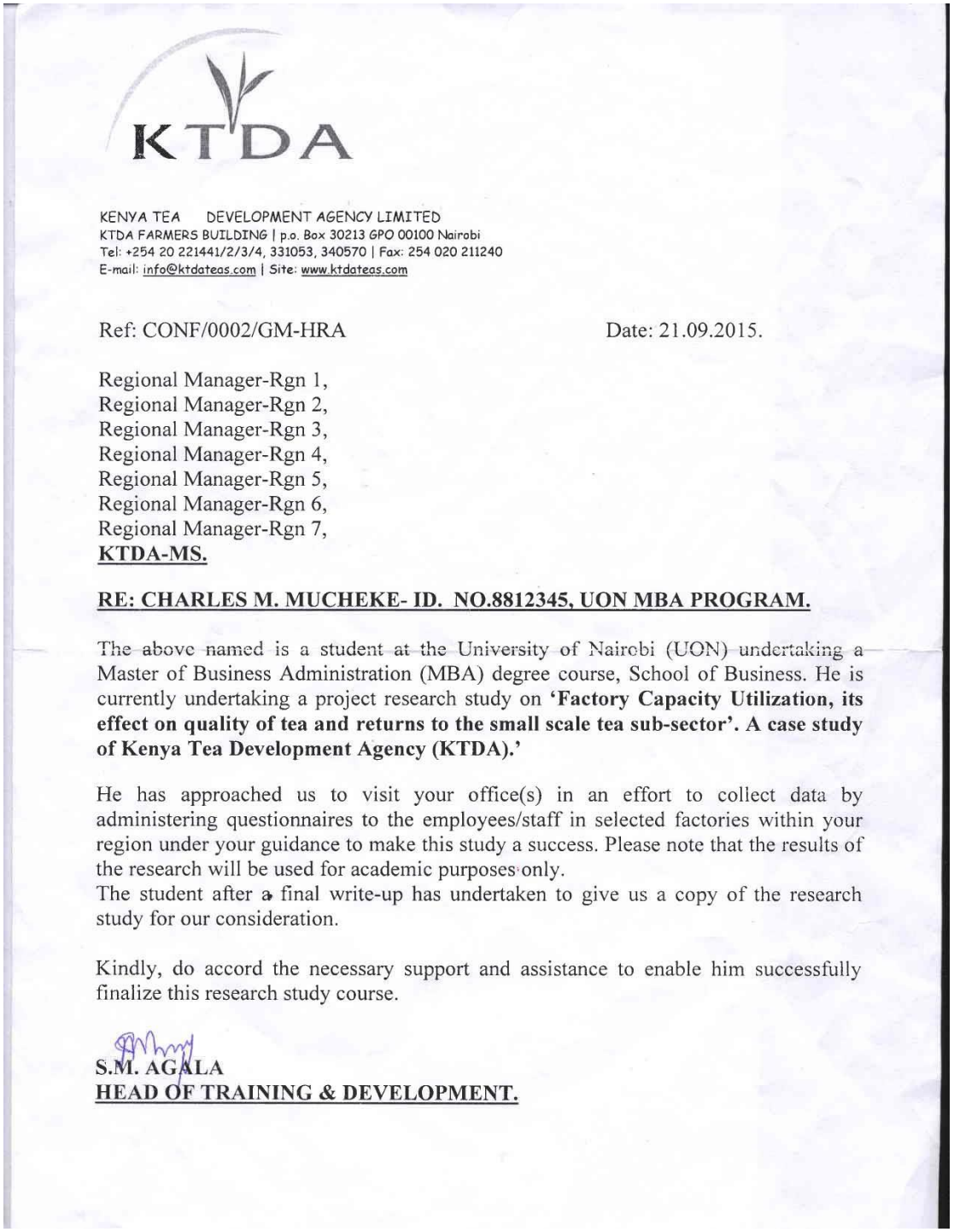
The results of the report will be used solely for academic purposes and a copy of the same will be availed to the interviewed organizations on request.

Thank you.

UNIVERSITY OF NAIROBI SCHOOL OF BUSINESS 12 SEP 2015 P.O Box 30197 - 00100, NAIROBI

PATRICK NYABUTO
MBA ADMINISTRATOR
SCHOOL OF BUSINESS

Appendix VII: Data collection authority letter from KTDA



KTDA

KENYA TEA DEVELOPMENT AGENCY LIMITED
KTDA FARMERS BUILDING | p.o. Box 30213 GPO 00100 Nairobi
Tel: +254 20 221441/2/3/4, 331053, 340570 | Fax: 254 020 211240
E-mail: info@ktdateas.com | Site: www.ktdateas.com

Ref: CONF/0002/GM-HRA Date: 21.09.2015.

Regional Manager-Rgn 1,
Regional Manager-Rgn 2,
Regional Manager-Rgn 3,
Regional Manager-Rgn 4,
Regional Manager-Rgn 5,
Regional Manager-Rgn 6,
Regional Manager-Rgn 7,
KTDA-MS.

RE: CHARLES M. MUCHEKE- ID. NO.8812345, UON MBA PROGRAM.

The above named is a student at the University of Nairobi (UON) undertaking a Master of Business Administration (MBA) degree course, School of Business. He is currently undertaking a project research study on **'Factory Capacity Utilization, its effect on quality of tea and returns to the small scale tea sub-sector'. A case study of Kenya Tea Development Agency (KTDA).'**

He has approached us to visit your office(s) in an effort to collect data by administering questionnaires to the employees/staff in selected factories within your region under your guidance to make this study a success. Please note that the results of the research will be used for academic purposes only.
The student after a final write-up has undertaken to give us a copy of the research study for our consideration.

Kindly, do accord the necessary support and assistance to enable him successfully finalize this research study course.

S.M. AGALA
HEAD OF TRAINING & DEVELOPMENT.

Appendix VIII: Research Questionnaire

Research Questionnaire

FACTORY CAPACITY UTILIZATION

This questionnaire is aimed at obtaining data for a Research Project (UON) whose objective is to establish the relationship between capacity utilization, quality of tea and returns to KTDA factories. It consists of four sections which will help in getting the relevant information and data required for this study. Kindly fill in all the information in the spaces provided. The research will benefit your factory, KTDA, GOK, the university and the tea industry.

Section A:

This section requires information on the factory. Kindly fill the information in the spaces provided.

Name of Factory……..

Year commissioned……..

Managing Agent……..

Region……

County…….

Name of Manager……..

Designation……Signature…….

Email Address……

Official Stamp…….Date…….

Section B:

This section consists of 7 questions regarding the machinery installed and their processing capacities. Kindly fill in the information required in spaces provided.

1. Withering: No. of troughs _____

   Size of troughs _____

Total withering capacity _____ ft^2

Time (average) taken to achieve withers _____ hrs

2. Cutting capacity (CTC): No. of C.T.C lines _____

Sizes 32"_____ 36"_____ and _____.42" _____

Throughput (cutting rate) _____ Kgs G.L/hr

Average moisture content (withers) _____ MC (%)

3. Fermenting capacity: No. of C.F.U lines _____

Sizes _____

Trollies (Nos.) _____

Total capacity _____ (Kgs/hr)

Average time for Fermentation _____ (hrs)

4. Drying capacity: No. of driers (FBD) _____

Capacities _____

Total throughput _____Kgs/hr

AV. M.C (%) _____

5. Sorting capacity: No. of presorters _____

No. of final sorters _____

Total throughput _____Kgs/Hr

6. Packing capacity: No. of packer machines _____

Total capacity _____Kgs/Hr

7. Steam Generation: No. of Boilers _____

Total capacity _____Kgs/hr

Section C.

This section consists of 10 questions on capacity utilization. Kindly fill in the spaces provided or circle the most appropriate answer that suites your factory based on your experience as a manager.

1. How many times do you re-use the withering troughs in a day (24 hours)

A. Once (1) ☐ B. One and half times (1½) ☐ C. Twice (2) ☐

D. Two and half times (2½) ☐ E. Three times ☐

2. How many hours within a day (24 hrs) should the facility (factory) be utilized to optimize on returns to farmers without compromising quality? _____Hrs

3. How many days out of 365 in a year are you in production? _____days.

4. When does your company start the financial year? _____

5. Indicate in the space provided below how the raw material (green leaf) is distributed on average within the quarters of a financial year for your factory.

QI _____%

Q2 _____%

Q3 _____%

Q4 _____%

Total 100%

6. In your opinion do you think capacity utilization plays a major role in determining returns to the factory?

A. Strongly disagree ☐
B. Disagree ☐
C. Not sure ☐
D. Agree ☐
E. Strongly agree ☐

7. Which section in the processing systems is currently the biggest bottleneck towards achieving optimum capacity utilization in your factory?

A. Withering section B. ☐ Cutting section ☐ C. Fermentation section ☐

D. Drying section ☐ E. Sorting section ☐ F. Packing section ☐

G. Boilers section (Steam generation) ☐

8. In your own experience how would you rank the different sections (in Q7 above) in terms of most critical to the least critical in determining capacity utilization in a tea processing factory, starting with most critical as no.1.

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. _____

9. Which is the greatest contributor to idle capacity in your factory? Tick one.

A. Seasonal supply of raw material (green leaf) ☐

B. Transport of green leaf ☐

C. Farm productivity ☐

D. Machinery breakdowns ☐

E. Mismatch of capacities in different sections along production system ☐

10. Arrange in order of importance the factors in Q9 (above) based their contribution to idle capacity in your factory starting with the one contributing the highest as No.1

1. _____

2. _____

3. _____

4. _____

5. _____

Section D

This section requires production data, farmers payments and average tea prices for 6yrs.

1. Production data 2009/10-2014/15

Year	G.L (Kgs)	Made Tea (Kgs)	Out turn (%)
2009/10			
2010/11			
2011/12			
2012/13			
2013/14			
2014/15			

2. Average Auction prices 2009/10-2013/14

Year	Price (USD)
2009/10	
2010/11	
2011/12	
2012/13	
2013/14	
2014/15	

3. Farmers Payments 2009/10-2013/14

Year	Monthly Pay(Ksh.)	Mini Bonus (KSh.)	Final Pay (Bonus) Ksh.)	Total Pay (Ksh.)
2009/10				
2010/11				
2011/12				
2012/13				
2013/14				
2014/15				

Give any other information you consider relevant to this study including 2014/15 data if the results are out.

THANK YOU

Appendix IX: Raw data on variables

Factory	Capacity utilization (%)	Returns (USD)	Quality Index
Mwamu	18	2.07	2.89
Igembe	26	2.38	3.24
Ndima	28	2.60	3.2
Gatunguru	28	2.18	3.04
Litein	31	2.13	2.69
Kanyenyaini	32	2.76	3.02
Giachore	32	2.13	2.77
Kobel	32	2.00	2.74
Mungania	33	2.74	3.13
Kapsara	35	1.90	2.64
Makomboki	36	2.65	3.11
Rukuriri	36	2.75	3.17
Kionyo	37	2.58	3.16
Nduti	37	2.67	3.06
Ngere	38	2.92	3.13
Njunu	38	2.21	3.03
Mununga	39	2.75	3.22
Kangaita	39	2.23	3.00
Kinoro	40	2.60	3.01
Gacharage	42	2.48	2.93
Theta	42	2.34	2.98

Michimikuru	42	2.48	2.84
Chebut	42	2.06	2.70
Tegat	43	2.11	2.70
Rorok	45	2.14	2.75
Tombe	47	2.19	2.93
Tirgaga	48	2.2	2.89
Kapkatet	51	2.14	2.71
Kathangariri	56	2.94	3.10
Kapkoros	56	2.25	2.92
Mataara	58	2.35	2.98