

**THE ECONOMIC CHALLENGES FACING SMALL SCALE SUGARCANE
FARMERS IN MALAVA SUB-COUNTY, KAKAMEGA COUNTY**

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SCIENCE AND TECHNOLOGY (MMUST)**

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DECLARATION

This thesis is my original work prepared with no other than the indicated sources and support and has not been presented elsewhere for a degree or any other award.

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CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance of Masinde Muliro University of Science and Technology a thesis **entitled ‘The Economic Challenges Facing Small Scale Sugarcane Farmers in Malava Sub-County, Kakamega County.’**

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ABSTRACT

Sugarcane production worldwide has been declining due to many challenges in several countries as their population grows. Earlier studies in the sugar industry have through years offered suggestions and solutions to how the ailing industry could be revived and improved but have not been successful. In Kenya, some sugarcane industries are closing down yet more sugar is needed. This study examined the challenges facing small scale sugarcane farming in Malava sub-county, Kakamega County. The study objectives were to: assess cane transportation problems, establish challenges related to the marketing of sugarcane and examine the effect of lack of capital equipment by small scale sugarcane farmers in Malava Sub County. It was undertaken in Malava Sub County where sugarcane is the economic backbone and the region's key cash crop owing to the favorable geographical conditions in Western Kenya. Despite the Malava Sub County's vast experience in sugarcane farming, production has gone down. Furthermore, such a study is yet to be done in Malava. The study purposed to find out the reasons for inefficiency and insufficiency in sugar production. A descriptive research design was used. Purposive and systematic random sampling techniques were used to select sugarcane farmers from the seven wards; Manda/Shivanga, Butali/Chegulo, Chemuche, East Kabras, West Kabras and South Kabras, Shirugu/Mugai and the sugar factory stakeholders in the two sugar factories; Butali and Kabras in Malava Sub County. Malava Sub-county has an estimated population of 65,323 sugarcane farmers. From this population, a sample of 384 was used, basing on Mugenda and Mugenda's formula of (2003): $n = \frac{z^2 pq}{d^2}$, for a target population which is greater than 10,000. Primary data was collected by use of questionnaires, interview schedules, Focus Group Discussions and observation guides. Secondary data was collected through literature search in online journals, theses and publications related to the study topic. Analysis was done using descriptive statistics aided by Statistical Package for Social Sciences (SPSS version 22). Presentation of data was done using tables, graphs and pie charts. A pilot study in Lwandeti and Chevaywa wards in Matete Sub- County was conducted to test the validity and reliability of the data collection instruments and Cronbach's alpha of 0.8 was good evidence of reliability. Research findings showed that 70% (269) of the respondents accepted that the transportation charges were high compared to other costs of production, 60% (230) of the cane farmers sampled said that there was ready market for mature sugarcane, while 40% (154) responded negatively and 100% of the farmers indicated that they never witnessed the weighing of their cane. Finally, 79.95% (307) of the farmers accepted that the equipment for operation on cane farming were mainly the locally available ones for instance, Jembes, Pangas, and ox ploughs; and 83% (319) of farmers failed to uproot old cane due to lack of money to hire the tractors and high technology equipment. These results, all combined led to low productivity by small scale farmers in Malava sub – county. This study recommended that sugar millers should meet the transportation costs, issue permits on time, and introduce mobile weigh bridges to allow farmers to witness the weighing of their cane and the Government to provide loans for small scale farmers to buy tractors for use within the village. Research findings of this study would be useful to sugarcane farmers, the community, county planning and the ministry of agriculture. They would also help Kenya to achieve self-sufficiency in sugarcane production embracing her vision 2030. The findings could also be replicated elsewhere in the world, where sugarcane is grown.

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LIST OF ACRONYMS

COMESA Common Market for Eastern and Southern Africa

EAC East African Community

EU European Union

FAO Food and Agricultural organization,

FARA Forum for Agricultural Research in Africa

GDP Gross Domestic Product

IAPSIT International Association of Professionals in Sugar and Integrated Technologies

IFAD International Fund for Agricultural Development

IMF International Monetary Fund

ISO International Sugar Organization

KESREF Kenya Sugar Research Foundation

KNTC Kenya National Trading Corporation

KSB Kenya Sugar Board

USDA United States Department of Agriculture

WFP World Food Program

WTO World Trade Organization

OPERATIONAL DEFINITION OF TERMS

For the purpose of this study, unless stated otherwise the following terms were applied to mean as indicated.

Capital equipment: Refers to any equipment used by an organization to produce other commodities. For instance, machinery, tools, and vehicles among other inputs used to generate a finished product.

Challenges: Refers to the shortcomings or the problems that sugar cane farmers encounters while farming.

Economic challenges: Refer to the problems in the economy that is concerned with the production of sugarcane.

Marketing: refers to the ability of the sugarcane farmers to find appropriate market for their produced sugarcanes.

Sugarcane farmers: This term is used to refer to people or entities who engage in the production of sugar cane as the cash crop they supply they supply to the manufacturing factories.

Small scale: Refers to the production of crops (sugarcane) on relatively small plots of land without using advanced and expensive technologies. In small scale farming, the land do not exceed four hectare and most of the labor is provided by family members and is manual in nature.

Sugarcane: A coarse perennial grass that has tall stout canes which yield sugar after maturity.

CHAPTER ONE

1.1 Background of the Study

According to Clowes, *et al.*, (1998), sugarcane (*Saccharum Officinarum*) is a sweet grass that flourishes in high temperatures and low rainfall but needs a lot of water to grow. Sugarcane is a crop that needs a great deal of labour and cannot be mechanized entirely to get the best products. Cushion, *et al.*, (2010) pointed out that cane farming is a worldwide activity practiced in most countries because of the major product it provides. The study also pointed out that, sugarcane is a crop which is grown both on large scale and small scale; (the small-scale farmers are known as out growers in Malava Sub-County). The cane plant is illustrated in Figure 1.1, Appendix I.

According to Jerome *et al.*, (2010), the major Sugarcane producers in the world include Cuba and the Caribbean areas, Brazil, Mexico, India and the Philippines. Currently, according to Walton (2018), the five countries that produce the most sugar include India, Brazil, EU, Thailand and China respectively. Cushion, *et al.*, (2010) added that sugar cane is the main source of revenue for several countries, particularly Central and South America and the Caribbean, where it is used to manufacture sugar, syrups, molasses, soft drinks, spirits and ethanol for fuel. However, despite all these benefits, there are challenges facing the sugar sector that contribute to its low productivity. According to FAO (2015), sugarcane is grown in most countries in sub-Saharan Africa (SSA), but five countries account for more than half the total production. They include: South Africa (33%), Sudan; including South Sudan (9%), Kenya (7%), Swaziland (7%) and Mauritius (7%).

Evidently, Zhao, *et al.*, (2015) asserted that the production of cane was and will continue to be influenced by changes in climate conditions directly or indirectly. In general, in most developed countries, there have been wide differences in cane yields. This is shown in Table 1.1, for years and regions of varying precipitation and temperature caused by limited potential for adaptation, high susceptibility to natural disaster, poor prediction and mitigation strategies.

Table1. 1: Trends in World’s Sugar Demand and Supply (2008-2014)

Period	Production	Consumption	Trade	End Stock
2008-09	113.84	153.46	39.62	30.3
2009-10	120.01	154.08	34.07	28.76
2010-11	129.98	154.79	24.81	29.83
2011-12	133.4	158.15	24.74	35.99
2012-13	139.71	163.67	23.96	43.16
2013-14	140.23	167.64	27.41	43.38

Source: United States Department of Agriculture, (2017)

Girei and Giroh, (2012); Singels, *et al.*, (2013); Tena, *et al.*, (2016) also found out that economic problems including transport, market and capital equipment were the major constraints faced by cane growers in other African Countries including South Africa and Nigeria. According to Waugh, (2009) cultural (human) factors were also a challenge to sugarcane farming. Waugh points out that inheritance laws and the fragmentation of holdings; in several countries, have meant that on the death of a farmer, the land is divided equally between all his sons (rarely between daughters). Those traditions led to the sub-division of farms into numerous scattered and small fields. Waugh, (2009) adds that fragmentation resulted in much time wasting in moving from one field to another and may cause problems of access.

According to Biancardi *et al.*,(2012), the sugar beet is yet another plant that produces sugar; it is known as the *Altissima cultivar* category of the common beet in plant breeding (*Beta vulgaris*). Biancardi, *et. al.* (2012) suggested that sugar beet is a crop whose roots contain high levels of sugar and are commercially cultivated for sugar production; sugar beet has a flat crown, conical white fleshy root (tap root), and the root and leaf rosette of the plant, as illustrated in Appendix III of Figure 1.3.

In Kenya, report by Mwangi (2009), in the Daily Nation indicated that, a group of farmers had been experimenting on the viability of sugar beet as an alternative in Nyandarua. Also, that, the European settlers grew them for domestic and animal feed. Consequently, after independence, indigenous Kenyans continued growing them for the same purpose.

One of the industrial crops in Kenya is sugarcane, KSB (2014). Kenya Sugar Board indicated that the industry has made a substantial contribution to the nation's progress considering the main importance of the sector to the economy, it has tended to perform poorly, resulting in a sustained production deficit.

Sugar Research Institute (SRI) 2020, indicated that the Kenya's sugar industry was dominated by the private sector prior to independence. With the founding of the Miwani Sugar Company in 1922, large-scale production and processing began and grew with the advent of the Ramisi Sugar Company in 1927. SRI notes that Kenyan government began to play a central role in the control and management of the sugar industry after independence.

Kariuki (2000), studied about the current challenges facing the Sugar Industry sub sector in Nyanza and Western regions. The study pointed out the challenges which included:

Policy and marketing problems that led to inability of factories to market locally produced sugar, in the face of dumped imports. Secondly, there were poor cane husbandry practices leading to low yield at farm level in quantities per hectare and in sucrose content. The study concluded that, low productivity levels at factory level led to low sugar yields, which in turn negatively affected cane husbandry practices. However, Kariuki (2000) did not address the issue of transportation problems; this study will try to fill this gap by extending to other challenges that face cane farming. Furthermore, the study was carried out in the whole regions of Nyanza and Western. This study is being done specifically in Malava which is a Sub-County in Kakamega County, Western region.

Waswa *et al.*, (2011), in their study about commercial sugarcane farming in the Lake Victoria basin pointed out that a lot of changes need to take place if the sugar industry is to be revived, because it still experienced a deficit in sugar production despite the measures taken by government and the industry players to improve the sector. The present study therefore has attempted to establish the challenges faced by the small-scale sugarcane farmers and suggested workable recommendations that could help solve the problems and revive the sugar industry in Malava Sub-County and Kenya as a whole.

1.2 Statement of the Problem

Sugarcane farming is a worldwide activity practiced in most countries because of the major product it provides; Sugar. Earlier studies in Kenya as indicated in the background of this study show that Sugar industry has made a substantial contribution to the nation's progress. It is evident that the number of by-products from cane outweighs other commercial crops like Tea and Coffee. As a worldwide activity however, it faces many challenges and production has gone down over the years.

Among the problems that small scale cane farmers face include; delayed harvest of their cane after maturity which leads to lose of cane value due to lost weight and Sucrose contents. Second, corrupt millers and or field officers frustrate farmers who would have to bribe before their Sugarcane is harvested. Third, Sugar prices have escalated in Kenya in the last couple of years due to shortage of sugarcane in the Western Sugar belt. The shortage of sugar cane has been brought about by farmers uprooting their cane after frustrations by millers' delay in payment among other problems. For instance, data from Sugar Directorate shows ex-factory sugar prices for May 2023 averaged Ksh. 8,597 per 50kg bag, a 21% increase from Ksh. 7,055 per bag in April and Ksh. 6,661 in March. It was therefore necessary that research be conducted in Malava Sub- County to examine the economic challenges facing the small-scale farmers.

1.3 Objectives of the Study

The overall objective of this study was to examine the economic challenges facing the small-scale sugarcane farmers in Malava Sub-County. The specific objectives of this study were to:

- i. Assess cane transportation problems that face the small-scale sugarcane farmers in Malava Sub-County.
- ii. Establish the challenges related to marketing of sugarcane faced by Malava sub-county sugarcane farmers.
- iii. Examine the effect of lack of capital equipment towards sugarcane farming in Malava Sub-County.

1.4 Research Questions

The research questions were;

- i. What are the transportation problems facing the small-scale sugarcane farmers in Malava Sub-County?
- ii. Which are the challenges related to marketing of sugarcane that face the Malava Sub-County sugarcane farmers?
- iii. What are the effects of lack of capital equipment towards sugarcane farming in Malava Sub-County?

1.5 Justification of the Study

Sugarcane is the economic backbone and the region's key cash crop owing to the favorable geographic conditions in Western Kenya. Despite the Malava sub county's vast experience in sugarcane farming production has gone down, furthermore, such a study was yet to be done in Malava.

Therefore, there was need to bring out knowledge on how the economic challenges were affecting the small-scale sugarcane farming in Malava Sub-County that may affect its productivity. The study could come up with appropriate suggestions to help solve the problem thus extending academic knowledge on sugar productivity.

The study is beneficial to the cane stakeholders in varied ways. The state may utilize the study to re-strategise their funding policies towards the operations the millers. Millers would also benefit from regular supply of raw material for sugar production.

The government would also use this information in making policies to safeguard the interests of small-scale cane farmers. The findings would guide the policy makers in the

government on developing policies that would protect both the cane farmers and the millers and avoid scenarios where one party takes advantage of the other.

1.6 Scope of the Study

The study focused on Malava Sub-County which comprises of seven wards: West Kabras, Chemuche, East Kabras, Butali/Chegulo, Manda/Shivanga, Shirugu/Mugai and South Kabras. There are two sugar factories: Butali sugar in Butali ward and Kabras sugar in West Kabras ward (Figure 3.1). The general purpose of this study was to examine the economic challenges facing the small-scale sugarcane farmers in Malava Subcounty. The sample population that was studied was 65,323 people. This study (data collection) was carried out from January, 2023 to April, 2023. This study was guided by Alfred Weber's (1909) Least Cost Theory of industrial location, in an attempt to examine the economic challenges facing the small-scale sugarcane farmers in the above-mentioned wards and the selected stake holders in the sugar millers.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section reviews the previous studies by researchers on economic challenges facing the small scale sugarcane farmers, with a view of establishing gaps that existed in those earlier studies; especially as they are related to the economic challenges facing the small scale sugarcane farmers in Malava Sub-County. This section is sub-divided into three thematic areas according to the study objectives: sugarcane transportation problem, challenges related to the marketing of sugarcane and the effect of lack of capital equipment.

2.2 Transportation Problems of sugarcane

Paitoon *et al.*,(2016) in a study about assessing the transportation problems of the sugarcane industry in Thailand revealed that sugar cane production and sugar mill expansion in the North-East of Thailand were increasing rapidly. The study found that sugar millers, among them: Udon Thani, Mukdahan, Kalasin and Khon Kaen, are located across the seven provinces. Demand from domestic and foreign markets rose and contributed to the nation's economic development. The study also showed that one purpose of the main sugar industries in Thailand was the production and processing of sugar cane into raw sugar.

However, the scholar pointed out that transport delays had been of significant concern since the cost of manufacturing was affected, which ultimately was reflected in the retail

price paid by the consumer. Paitoon pointed out that, in proportion to other variable costs, transport costs were found to be very high. Research in Thailand demonstrated that the majority of cane growers in the North-East were small-scale farmers working with their own families; since most of them did not own a truck and usually had only a small or traditional multi-purpose vehicle, they had to pay the cost of transporting the cane from their farm to the millers which included; Kumpawapi, Mid Kalasin and Ratcha. As the supply of cane per transaction demanded a bulk carrier, both small and large-scale farmers faced a common transport issue because they were required to rent a truck and pay hired workers for sugar cane cutting and loading the truck. Malava cane farmers may also be facing the same problem.

Paitoon *et al.*, (2016) also noted that the sugar millers in the North-East area face an insufficient supply of raw materials for crushing at the beginning and end of the season, while the supply is higher than the capacity of the sugar millers at the peak. Hundreds of trucks could be seen standing in front of the sugar millers waiting for the cane to unload at that time. The scholar suggested that truck owners run their businesses as middlemen by charging each ton for transport services. He added that with just one transaction, truck drivers could spend up to 24 hours, which, of course, had an effect on transportation costs. The research found that all three groups, namely the owners of sugar millers, cane farmers and truck operators, were impaired by the transport problem, which heavily impacted the manufacturing costs, resulting in low productivity.

The research by Chamnalaw *et al.*, (2004) in Thailand, about solving truck allocation problem in sugar industry disclosed that, the lengthy wait line for trucks to offload sugarcane at the sugar miller was one of the causes of high transportation costs. Each truck was to wait for an average of 20 to 35 hours before unloading sugar cane; the

carrying cost was then highly charged to compensate for the long waiting time. The study suggested that one of the successful systems was to decide the number of trucks used to transport cane from farms to the sugar millers in a year's harvest, both 20-ton and 8-ton trucks. The scholar stressed that, in the next crop year, the trucks that would be used to move sugar cane from farms to sugar millers must be registered for the millers. By that approach, all trucks could easily be planned and operated by the sugar mill. Before the harvesting season commenced, the truck schedule and harvesting plan could be provided to the farmers.

Lamsal, *et al.*, (2016) research on sugarcane harvesting logistics operations in the state of Louisiana in the United States suggested that a sugarcane harvesting and transport coordination program had been established. They also found out that by optimizing the minimum distance between successive arrivals at the sugar mill, they aimed to minimize waiting times at the mill. Their results revealed that arrivals could easily be coordinated to reduce truck waiting at the millers. This study tried to establish to what extent are the above problems replicated in Malava Sub-County.

In China Yang *et al.*, (2014) at the International Conference about Sustainable Growth of Sugar and Integrated Industries in Developing Countries, disclosed that there was a global review of research and development activities in the field of sugar crops. The scholar pointed out that there was hope that the conference would provide a great opportunity for the benefit of global sugar and allied industries for scientists, technology, extension officers, business, policy makers and other stakeholders to meet and share their views and experiences.

The scholar added that in the last ten years, the International Sugar and Integrated Technologies Technical Association (IAPSIT) had become a global association and that,

after Brazil and India, China was the third largest sugar productive state. This research was intended to establish if such sugar conferences were conducted in the Malava Sub-County.

The study by Warner, (1968) in South Africa about problems of sugarcane transportation found out that an ideal system was one which the sugarcane was handled from the time it was loaded in the field until it was put into the carrier. Warner argued that, every additional handling meant increased cost and generally waste of cane. The scholar added that cost is either directly or indirectly always borne by the producer. Warner's own opinion was that up to one-mile radius from the sugar miller, wagon transport was the most economical. The scholar indicated that, its advantages were that the field loading was made easy, because the wagon could be brought close up to where the cane cutters were working and so eliminate a long carry. This study assessed if wagon transport was being practiced in Malava Sub-County.

The study by Dangote, (2003) in Nigeria on problems and prospects of the Nigeria sugar industries revealed that there was constant hiking of petroleum products, which affected cane farmers; the scholar pointed out that, both the large and medium scale sugar plants required fuel to operate; and that the high cost of oil and other fuels made production cost of any local sugar quite high.

The Research carried out by Chimwai, (2011) in Zimbabwe on economic challenges faced by sugarcane Farmers revealed that, cane productivity was declining. It was discovered that low productivity was largely due to high transport and haulage charges, among other economic challenges. Chimwai further pointed out that the Lowveld in Zimbabwe had been identified as one of the best places to produce sugarcane in the world. The study indicated that the climate was ideal for sugarcane and distances from

the sugar mill were quite manageable. This had adopted Alfred Weber's (1909) Least Cost Theory of Industrial Location which emphasized that firms seek a site of minimum transport and labor cost. But it was found out that, despite the benefits that could be reaped from sugarcane, production had gone down over the years. This study in Malava Sub-County attempted to establish if the above problems were also facing Malava sugarcane farmers.

Mukhwana, (2015) in a study about unsustainable finances of the sugar economy in Kakamega County in Kenya revealed that transport was a costly service that farmers had to bear; and that it burdened farmers with expenses. The scholar gave the situation in which the farmers admitted that 'quiet' transport costs were incurred by bribing the transporters to prioritize their farms and transport the sugar cane. Mukhwana added that this was an adapted technique for farmers to try to save their drying cane. Furthermore, transport costs showed that other variables could be behind the high transport costs; for example, most of the cane processing zones were beyond the company's twenty-four-kilometer radius in the Mumias sugar mill. This led to a higher transport charge for each ton of cane shipped. By observation, the scholar also noticed that the roads were also impassable during the rainy season, as most of them are surfaced with murrum.

The findings of Mukhwana also revealed that the sugar cane often took up to one week after harvesting before being transported to the mill; and that this compromised the tonnage returns to the farmer because in the interlude between harvesting and transport, a certain amount of weight was lost, which in turn reduced the estimated net pay of the farmers. Mukhwana (2015) concluded that, the sugar cane should be timely transported to the millers after successful harvesting to prevent both the depletion of sucrose content and the decrease in tonnage of the harvested cane caused by drying on the field. Weber,

(1909) In his Least Cost Theory of Industrial Location suggested that an industry be situated where there is a minimal cost of transport for raw materials and finished goods. This statement agrees with what Waugh, (2009) pointed out that, the need for speedy transport to the market demands an efficient transport network. This study attempted to find out to what extent the small scale sugarcane farmers in Malava Sub-County might be facing such problems.

2.3 Marketing Problems Facing Small Scale Sugarcane Farmers.

Button *et al.*, (2015) concurred with Waugh, (2009) who indicated that the role of markets is closely linked with transportation (perishable and bulky goods). Waugh, (2009) had also pointed out that the demand depends upon the size and affluence of the market population. According to Whittman *et al.*, (2010), the capital annual consumption of sugar in the world was averagely 21.6 kg; in India, was only 16.3kg as against 48.8kg in the United States of America (U.S.A), 53.6 kg in United Kingdom (U.K), 57.1kg in Australia and 78.2 kg in Cuba, (Raju, 2015). Whittman and associates argued that, it resulted in low market demand and created problems of sale of sugar, which opened way for dumping sugar and sugar products on markets, mostly of developing countries. They concluded that, whatever the form, dumping ruined small scale local producers in both the countries of origin and sale. For instance, imports of sugar to Kenya by Sudan had a negative impact on local family based sugar production; Dumping occurs when goods are sold at less than their cost of production as indicated by Whittman, *et al.*, (2010).

In a research carried out by Faraz, (2013) on cane cultivation problems and prospects in Pakistan, it showed that the price of cane which was determined by the government was one of the problems faced by the farmers at marketing stages of the crop. This was because, according to Faraz, the price was based on the weight of cane instead of sucrose

content. The scholar added that, this encouraged inefficiency in cane cultivation, because farmers put less effort in improving their crop quality for high sucrose content. Faraz also pointed out that farmers complain that sugar millers were unable to purchase their yield immediately. This delay led to loss of moisture from the agricultural produce, making it lighter and thus less valuable. Kokeyo (2013) also made similar observations in Kenya on "An assessment of the factors affecting contract farming." Kokeyo pointed out that the contract farmers reported that they had elevated post-harvest sugarcane losses because their goods were weighed at the reception area of the sugarcane factory rather than at the farm gate. This research attempted to establish whether these problems were also faced by the small scale sugarcane farmers in Malava Sub-County.

Faraz's research results also imply that the Pakistan Sugar Mills Association (PSMA) was a very powerful association in the country that represented the interests of the sugar industry. Faraz, however, pointed out that, on the other hand, both official policy and public discourse have generally ignored the needs of farmers. The scholar stressed that, despite the fact that they were the real producers of the crop, those who cultivated sugar cane were heartfelt in the marketplace; sugar millers or processors were often the main beneficiaries of any price rise. He concluded that, if the markets were free and fair, higher prices should have resulted into incentives for farmers to grow more crops; but on the contrary, sugarcane production had gradually gone down in recent years. The current study therefore, attempted to assess if the Malava sugarcane farmers were also facing such market problems.

The Economist Group study (2017) showed that a tiny fraction of the global supply was made up of sugar exports from African countries. The report added that sugar was a major contributor to export profits, jobs and economic development for many countries in

Africa. However, it pointed out that Africa would be at risk of losing its key sugar export markets, with major economic changes coming into effect in the European Union in 2017 and the European market primed for a substantial supply/demand change. In addition, the rising demand from within the region could provide an alternative to Europe, but the report showed that slow progress in tackling trade barriers between countries meant that the opportunity was likely to go unrealized.

The research by Chimwai *et al.*, (2011) on economic challenges in the production of cane in the Lowveld of Zimbabwe showed that low prices were charged for the sugar cane harvested; these affected most of the operations of the farmers as they were unable to pay competitive salaries, repair equipment and purchase fuel. If the economic challenges facing the sugar industry are resolved and more sugar is made, the high demand for fuel and electricity could be eased. According to Chimwai *et al.*, (2011), this was so because Sugarcane by-products could be used for the production of electricity and also for ethanol that could be mixed into gasoline. This means that, since they would not import electricity and fuel during the milling season, the nation would save foreign currency. This study tried to find out if such problems are faced by the small scale sugarcane farmers in Malava Sub-County.

EPZ, (2005) in a study about the influence of sugar factories on improvement of sugarcane farmers revealed that agriculture is a dominant sector in the Kenyan economy. The sector is also indicated to be the largest contributor to foreign exchange through export earnings from tea, coffee and horticulture, among others. Farming also offers employment and is a source of subsistence for a significant percentage of the population. It also noted that an estimated 75 percent of the population relies either directly or indirectly on the industry. EPZ (2005) indicated that sugarcane is currently grown in the

flat regions of the Western, Nyanza and Coast Provinces in Kenya. It was also pointed out that, despite the fact that sugar is the second largest contributor to Kenya's agricultural growth after tea, sugar produced in Kenya does not meet demand and sugar has therefore been imported.

Whittman *et al.*, (2010) in their study on food sovereignty, found out that the food sovereignty of people is a right for those people to establish their own agriculture and food policies. Also, in order to achieve sustainable development goals, to protect and control domestic agricultural production and trade. Finally, to assess the degree to which they want to be self-reliant and to limit the dumping in their markets of the goods.

Whittman *et al.*,(2010) also stated out that it is important that food be provided through a diversified farmers-based production system in order to guarantee the freedom and food sovereignty of all the citizens of the world. In their study results, the scholars recommended that dumping should be avoided and that countries should be able to protect their home market against dumping and other business activities that prove to be harmful to local producers.

Whittman *et al.*, (2010) argued that all of these were weakened by organizations such as the World Trade Organization (WTO) and the International Monetary Fund (IMF) by leading political and economic forces such as the United States (US) and the European Union (EU). Instead of securing food for the world, these institutions also presided over a regime that prioritized export-oriented development and increased global hunger for sugar. The present study attempted to find out if these economic challenges are also faced by the small scale sugarcane farmers Malava Sub-County.

The study by Brenda, (2012) on problems facing cane farming in Kenya, reported that, flooding of markets by cheap imported sugar resulted in unfair competition. This caused delay in disbursing payments to farmers by sugarcane companies. Kweyu, (2013) made similar observation in his master degree thesis about “factors influencing withdrawal of farmers from sugarcane farming.” Kweyu revealed that the cane farmers in Mumias Sub County had pulled away from growing sugarcane because of delayed payment for the sugarcane supplied to factory. Brenda (2012), further viewed that Kenya is among the African Countries that are faced with the economic problems contributing to the decline of sugarcane production. Brenda also argued that apart from being faced with problems such as pests, diseases, accidental fires and closure of factories such as Ramisi and Miwani sugar, factories in the country are fleecing farmers by charging them highly for services and inputs extended to them on credit. Could these problems also be facing Malava cane farmers?

The report by Amadala, (2014) on why the poor sugarcane farmers would remain a slave to the millers agrees with Brenda that it is one of the greatest problems in the agricultural sector. He also found out that reports seen by the nation from many farmers in Bungoma, Kakamega, Migori and Homabay, among other parts of Western Kenya, indicate that, among other expenses, farmers paid heavily for cane deliveries to factories, ploughing, furrowing, seeds, harvesting, and supply of fertilizer. This lowered the morale of the farmers and their potential for extensive farming. This Malava cane farming study intended to establish whether the small scale cane farmers were also faced with these challenges.

The Utafiti Sera Policy (2015) study indicates that, with a projected production of 632,000 metric tons and consumption of 879,000 metric tons as of 2015, sugar remains one of the primary commodities in Kenya. The study adds that over 250,000 small-scale farmers and about 6 million Kenyans are directly or indirectly funded by the sugar industry. Despite public investments in sugar plants, self-sufficiency in sugar has remained elusive, the study concludes. Also, demand has mostly outstripped domestic output over the last 30 years, as shown in Figure 2.1.

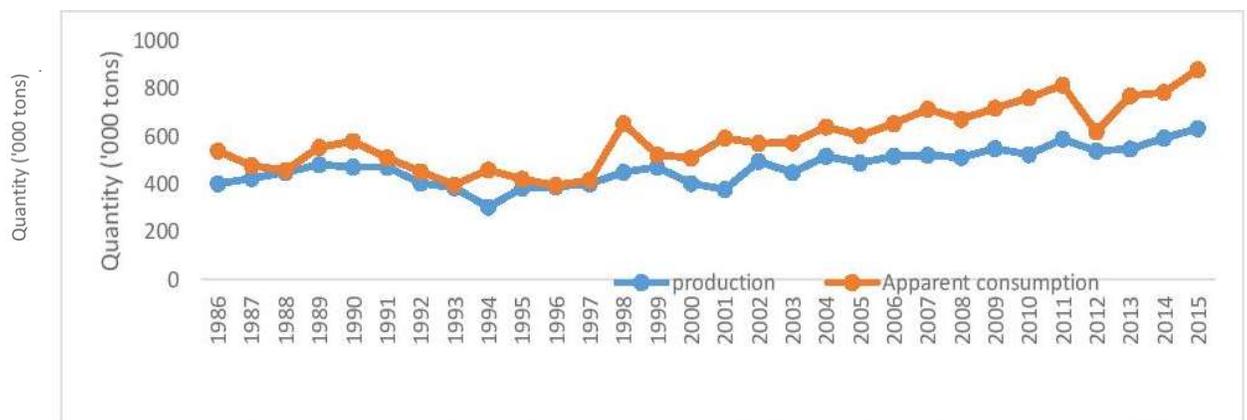


Figure 2. 1: Sugar Production and Consumption trends in Kenya

Source: Food and Agriculture Organization Statistics data and Economic survey 2016

Production and trade evidence (Figure 2.1) indicates that Kenya's self-sufficiency in sugar production is far from being achieved. Monroy *et al.*,(2013) made related findings in the "Analysis of sugar incentives and disincentives in Kenya." The study pointed out that the sugar intake in Kenya has risen steadily over the last three decades, outpacing domestic demand. This may have been a concern in Malava.

Report of the Sugar Farmers Task Force (2019) indicates that, Kenyan Sugar production peaked around 600,000 tons in 2015, (Figure 2.2).

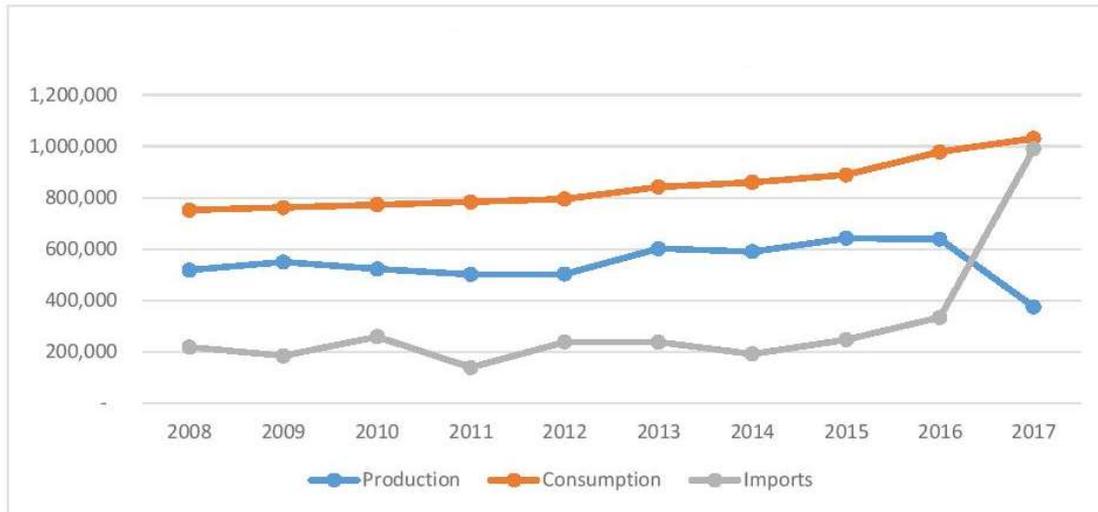


Figure 2. 2: Kenya Sugar Statistics (2008 – 2017)

Source: Food and Agriculture Organization Statistics data and Economic survey 2015

The report adds that consumption was slightly over 1 million tons, while imports made up the difference with COMESA countries. The report also pointed out that, the global market is oversupplied with sugar, an oversupply situation that will continue for foreseeable future. This study attempted to establish to what extent suc

In a research carried out by Baraza, (2017) in Kenya, about the elected leaders failing the sugar industry indicated that, West Kenya sugar company in collaboration with powerful politicians in government were flooding the country with imported duty-free sub-standard sugar. Baraza pointed out that, this was in total disregard of standing high court orders banning the same. Baraza had established that the sub-standard commodity whose quality had not been tested by the Kenya Bureau of standards (KBS) was repacked into containers passing it off as a product of West Kenya’s Kabras factory branded as ‘Kabras Sugar’. And that it had also emerged that the directors of the company were colluding with powerful politicians in government who also had huge financial stakes in the business making a killing in a country starved off locally produced sugar due to failure to meet the production capacities.

Baraza, J. further pointed out that, at the same time, proceeds of huge profits of the illicit trade were being used to compromise some Kenya Revenue Authority (KRA) officials to look aside as the commodity was imported and camouflaged as sand; and that what was clear was the fact that the company's directors were taking advantage of their close business ties with powerful politicians in government not only to be involved in illicit import trade, but also viciously undermine its competitors. It was also reported that the sub-standard sugar imports were posing a great health hazard to millions of un-suspecting consumers since its quality had never been verified by the Kenya National Bureau of standards as required by the law.

Waswa, *et al.*, (2011) pointed out that with Kenya's population growing at a rate of 3.3% and annual sugar consumption growth rate being estimated at 2% annually, the demand for sugar will continue to increase, while already there was a deficit.

According to Waswa *et al.*, (2011), their research findings from Chemelil, Lurambi and Koyonzo in Western Kenya showed that on average farmers retained 34, 32 and 31percent respectively of the gross income from contract sugarcane farming. While traditional input costs affected net sales differently, yield appeared to be a key determinant of gross income across the sites. Net income was also significantly depressed by company-driven deductions that were not controlled by farmers. Langat, (2015) pointed out that such unequal income sharing, where at least 60% of the gross income was held by sugar firms, posed sustainability issues that need to be resolved by a participatory approach involving all main stakeholders. He further suggested that in the face of these difficulties, Kenya's sugarcane farmers had vowed to uproot the crop. This study tried to establish to what extent such problems were facing the Malava cane farmers.

According to the KSB, (2014) Report; Both small scale and large-scale farmers in the sugar industry face various problems that affect their live hoods. The report mentioned among some of which included low prices of sugarcane due to importation of cheap sugar and non-payment of dues to farmers by the cane factories. It was for these reasons that the Malava study and similar other studies were needed for solutions to be found in order to curb the challenges and improve the sugar industry in Malava Sub-County.

2.4 The Effect of Lack of Capital Equipment

The research results by Wada *et al.*, (2006) in China on the financing of research and production of sugar cane revealed that funding was insufficient. The scholar argued that the responsibility for financing sugar sector research in other sugar producing countries like Brazil was shared between the government, the sugar companies and the cane growers. This research attempted to assess whether the issue of funding is also faced by small scale sugarcane farmers in Malava Sub County.

Solomon, (2016) of India, in his study about chemical ripening (a practice to enhance sucrose content in many sugarcane growing countries); found out that the chemical known as Glyphosate-Borate complex was effective ripener even under water deficit stress and did not affect sprouting of subsequent ratoon crop. This study tried to find out if the Malava cane farmers also practiced chemical ripening.

According to Yang, *et al.*,(2014), another proceeding, IAPSIT International Sugar Conference held in November 25th to 28th (2014), in Nanning, China had their main focus on new and emerging technologies which would harness the green power of sugar crops. The International Conference aimed to discuss in detail, the “Challenges facing the sugar industries in developing countries.” This study of Malava sugarcane farmers also sought to find out any new and emerging technologies of the sugar crops.

Bardhan, (1973) in a study on an analysis of farm level in India, asserted that there is an inverse relationship between production per acre and farm size and other inputs, rather than economies of scale. He explained that this suggests that even a small piece of land with sufficient inputs can still be incredibly effective. Likewise, a study by Thorburn, (2007) in Durban, South Africa, about systems to balance production and environmental goals of Nitrogen fertilizer management, noted that the majority of planters were considered to be about 90% smallholder farmers, who normally planted less than 5 hectares of land with income below the poverty level, and thus could not afford to maintain input requirements for sugar cane farming without outside financial help. Thorburn added that cane farmers depended primarily on the allocation of production loans from cooperatives at the right time, and that it was difficult to observe the rate of application of fertilizer and other agricultural inputs. Therefore, fertilizers application was usually late and often times, only one application was effected. Could Malava Sub-County cane farmers be facing such problems?

The study by Herrero *et al.*, (2017) of Lancet Planetary Health, on farm scale, agricultural biodiversity and nutrient production established that small and large farms play a key role in food and nutrition conservation. They revealed that more than 75 percent of most food products are produced by small farms (below 20 hectares). A study by Savastano, *et al.*,(2017) of the World Bank Organization, about analysis on farm size and productivity found that the relationship between the threshold and the amount of land owned is positive in the case of continuous land input supply and negative when there is discontinuous supply of inputs. This study of Malava Sugarcane farming attempted to asses if inputs are also critical in Malava Sub-County.

Sugar conferences on how to improve conditions on the world's sugar market have been held worldwide. For instance, Brown, (2012), the Secretary Organizing Committee of the Fourth Food Agricultural Organization (FAO) sugar conference held on 21st to 23rd August, 2012 in Lautoka, Fiji. Brown, (2012) reported that the world's sugar economy is beset by complex problems affecting both developed and developing countries as national policies strongly affect production, consumption and trade prospects. Brown added that in order to meet these challenges, the FAO had organized conferences to address those topical issues. Among their objectives were to analyze trade and markets and to analyze socio-economic costs affecting the livelihood of farmers. This was particularly small holders who make up the bulk of developing country growers. Brown's report was contrary to what Anderson (2018), of the University of Arkansas, Swaziland revealed in his study on "factors driving sugarcane production in the kingdom of Eswatini". Anderson pointed out that there was lack of extension services throughout Africa. This study attempted to assess to what extent is such a problem facing the Malava cane farmers.

In research conducted by Reddy (1998) on the Fiji industry about farm productivity, efficiency and profitability concluded that lower inputs definitely cost savings yet decreased productivity. The inputs listed in the study were soil quality; which refers to fertility, productivity and tenure; labor, fertilizer, herbicides and machinery. In Fiji, 73% of the cane land was leased from landowners; Reddy (1998) also asserted that ownership uncertainty had a negative effect on farm investment and productivity. FARA, (2008) also found out in their research that regular movement of landless people ended up in occupying land, which resulted in violent conflicts with the legal owner who was often supported by the police. The scholar pointed out that the rate of conflicts was said to have

gone up as a result of the increased sugar cane production and argued that continuous sugarcane planting for many years in the same land resulted to less sugarcane production. This study tried to establish if Malava sugarcane farmers were also facing such problems.

Kodituwakku (2013), in a study about “an economic study of potential production-promoting sugarcane and sugar policies in Sri Lanka” revealed that, sugarcane production was more profitable. Kodituwakku pointed out that, relative to the rainfed regions, production was therefore competitive in irrigated regions. The later regions were important for the development of sugar cane in Sri Lanka as they accounted for more than two-thirds of the area under cultivation.

Kodituwakku also revealed that, due to low yields and higher production costs for sugarcane crops, the major sugarcane growing areas were not competitive compared to other crops. The scholar also showed that sugarcane was a labor-intensive crop, and that harvesting constituted an important part of production costs. Kodituwakku however, proposed that mechanization of the harvesting operation would lower the costs.

Tang, *et al.*,(2008), in their research on the effect of fertilized mud, vinasse and sugarcane residues in the soil microbial population in the sugarcane field stated that soil bacteria and fungi were increased by the use of organic material. On the other hand, Abdullahi, *et al.*,(2007) noted that other workers considered filter mud to be an organic nutrient source of great benefit in Iran and South Africa to grow sugar cane. Tang and others (2008) agreed with Abdullahi that improper use led to an increase in the soil microbe with interference in sugarcane growth. While the acceptable rate served to understand the interrelationship between the availability of soil micro nutrients that helps to boost fertilizer performance. This study attempted to find out if sugarcane residues were applied in Malava Sub-County.

Hoyle, (1979) in a study on the developments in sugarcane production in the Sudan pointed out that, in East African region, sugarcane was introduced by Europeans after its origin in South-East Asia. The scholar added that in Sudan, sugarcane is mainly grown under irrigation; Kenana sugar being the main irrigation area. Others are valleys of Blue Nile and valleys of Atbara while in Kenya, sugarcane is grown both under natural conditions and irrigation. The standard media group (2016) indicated that, in Kwale county, one of the Kenya's newest Sugar Company "Kwale International Sugar Company Limited, (KISCOL)" is banking on irrigation to increase production in readiness for the retail market. The Standard Media Group added that KISCOL also planned to take advantage of the fact that sugarcane at the coast takes a shorter time to mature compared to other growing zones in traditional cane growing areas of Western Kenya. This is due to the conducive weather as reported by Benson, (2017) of the Kenya Broadcasting Corporation (KBC).

According to Hoyle, (1979) Sudan is the third largest sugar producer in Africa after South Africa and Egypt. Sudan produces around one million tons per year of which about 0.2 million tons is exported. However, the scholar added that the country is deficient in sugar as the consumption in Sudan reaches 1.6 million tons per year. In general, there is great potential in both sugar ethanol productions as Hoyle pointed out that exports of ethanol have already taken place since 2009.

Ahmed, *et al.*,(2015) in their analysis on the evaluation of mechanical verses of manual sugarcane harvesting in Sudan – the case of Sennar Sugar Factory revealed that manual harvesting is more costly (8.98 SDG/ton) than mechanical harvesting (4.95 SDG/ton). These findings were in accordance with those revealed by Sundara, (1998) in Zimbabwe, which also placed second in the group of machine labor. Salaries for cane cutting labor

accounted for 74.14 per cent of the total cost of cutting labor, 46% of the total cost of harvesting manual labor and 18.9 per cent of the total cost of harvesting. Ahmed, *et al.*, on the other hand, found that in-field cane losses accounted for 4.72 percent and 4.22 percent of real yield for manual and mechanical harvesting systems, respectively. Still, in Ahmed's opinion, the percentage of trash was just 3.66 percent for the manually harvested cane, while the mechanically harvested cane hit 9.49 percent. This study tried to find out if the Malava cane farmers use manual or mechanical harvesting.

Research done by Chimwai, *et al.*, (2011) about economic challenges of sugarcane production in the Lowveld of Zimbabwe has revealed that the equipment that is necessary for a sugarcane farmer includes: tractor, disk harrows and plows for land preparation, Perry loader and Massey cane for shipment of inputs and sugar cane to the loading field. Chimwai pointed out that most farmers spend the bulk of their income on hiring and transporting machinery. The findings of the scholar in Lowveld, Zimbabwe, disclosed that ultimate crop production is heavily dependent on sound application practices for fertilizers, calling for the application of correct quantities of fertilizers and water and timing of applications.

Chimwai claimed that all the farmers did not have ready access to fertilizer. The Scholar also pointed out that farmers agree that the use of fertilizers is necessary soon after cutting, at 4 weeks and at 8 weeks, but it was found that it is typically not complied with because the precious ingredient (fertilizer) was unavailable. This is possibly a concern in Malava. Furthermore, it was found that the low yield would be encountered if the applications did not take place at the right time. The findings of Chimwai's research showed that inputs for farmers in the Lowveld were hard to come by. Similar observations were made by Kokeyo (2013) in Kenya in an assessment on the factors

affecting contract farming in Migori County. Kokeyo disclosed that fertilizer was only issued as requested by cane farmers and that the producers either did not demand the fertilizer from the millers because of the high price or requested lower quantities than the recommended rates, which in turn reduced the yield of cane and therefore the production as indicated by KESREF (2013). This Malava sugarcane farming study attempted to find out if these problems of input unavailability were faced by the small scale sugarcane farmers in Malava Sub-County.

Chimwai also noted that productivity was impacted by the ratoon age; for most farmers in the Lowveld, the ratoon age was over 15 years. The study also found that farmers had inherited white farmers' cane and had never uprooted the cane. A significant percentage of the farmers interviewed were over 15 years old and had not ploughed them, according to Chimwai. The study also indicated that only a portion and not the entire field was uprooted by the smaller percentage who claimed that they uprooted their sugarcane. Most of them were conscious that as their cane was older it was not more viable, they could not plough their fields as the hiring charges were high. Chimwai figured out from cane farmers that there was a shortage of resources to carry out the exercise. The scholar suggested the cause of cane farms' failure was the old ratoon and that they would like to see the production rise if they obtain money to uproot the old cane. The scholar further argued that inefficiency at farm level raising costs could not be effectively distributed and would not be minimized if farmers and laborers did not undergo appropriate training. Kokeyo (2013) agreed with Chimwai that cane farmers were not provided enough information to increase production through modern farming methods. The present study also attempted to determine whether farmers face such problems that they do not uproot their old sugarcane due to high rental charges.

According to Sundara (1998), the cost structure of sugarcane farming is such that human labor takes 45 percent, pesticides take 4 percent, manure and fertilizer take 14 percent, seed canes consume 14 percent and machine labor 17 percent, while interests consume 4 percent. However, the scholar insisted on the fact that the costs incurred depend on the degree of crop management by the farmer, the economic situation of the farmers and the availability of credit. That is why Sundara (1998) rated machine labor the second, although fertilizer, manure and seed cane had major demands on the farmer's coffers. The scholar further pointed out that the inputs were required within 3-4 months of planting to get the best crop.

Sundara, (1998) had also claimed that the rate of return to the sugar industry was established by the pace of the application on the cultivated crop. In the cases of input of fertilizers not available on time, it affected the rate of growth and hence the return per piece of land was affected. Sundara, argued that the use of slow-releasing Nitrogen fertilizer technologies saves about 70kg per hectare. The scholar suggested that if fertilizer is used manually, the precious input could be over applied or used in full. This study of Malava tried to establish if there was availability of required quantities of inputs whenever they were needed.

Study by Clowes, *et al.*, (1998) in Zimbabwe concurred with Reddy (1998) in Fiji who also established that lower input usage would definitely save costs but reduce productivity. In addition, the scholar argued that the age of ratoon had an inverse correlation with crop yield, saying that if no new cane was planted, it suggested a decreasing productivity pattern. Clowes, *et al.*, (1998) also reported that inputs were very critical in achieving good yields. The main element to be controlled for efficient production was crop, fertilization, irrigation and ratoon management, among other inputs.

He also pointed out that it was important to develop the correct cane varieties for the climate and soil. The current study in Malava sub-county attempted to assess if there was ratoon management and planting of new sugarcane.

Clowes, *et al.*, (1998) even argued that the more sophisticated the mechanized system to be implemented, the higher the standard of field preparations required. That if this was not observed there would be problems of water logging and even crop loss during harvesting. The scholar pointed out that farmers needed adequate extension services and training to be able to be efficient and productive. Clowes, *et al.*, also argued that sound agronomic practices such as timely preparations, selection of adapted varieties, proper fertilization and weed control were critical for quality sugar cane production. This study attempted to establish if mechanization is practiced by cane farmers in Malava Sub County.

Langton, (2007) in a study on the South Africa sugar industry, about machinery systems for sugarcane production concluded that the industry was becoming less viable because of labor shifting. According to Langton, farmers needed to be mechanized not to depend on manual labor as labor had become scarce. The study of Chimwai, *et al.*, (2011) also revealed that 75% of the farmers in the Lowveld Zimbabwe did not own tractors. They hired the services of Estate tractors or tractors owned by their colleagues, Chimwai and associates agreed with Langton when he pointed out that the tractor is important in land preparation, carrying inputs and workers to the fields and handling sugarcane when the distance is short also, that the Perry loader is important in loading the cane but only 13% had the equipment, according to the study findings. The Massey cane is a heavy-duty trailer that carries bundle of sugar cane to the loading zone, and that without the Massey

cane the tractor cannot carry the cane to the miller or loading zone. This could be a problem facing the Malava cane farmers. This study attempted to find it out.

In their study exploring the role of sugar cane in the livelihoods of small-scale farmers in the Noodsberg area, Kwazulu-Natal, Cockburn *et al.*, (2014) of South Africa found that sugar cane played an important role in the livelihoods of small-scale growers (SSGs) in the Noodsberg area of the Midlands North region. They pointed out that cane contributed to food security for households and provided educational money. Sugarcane was considered, according to Cockburn, to be the most important crop in a complex system of crops and livestock. Cockburn *et al.*, however, pointed out that weeds and high input costs were considered by the SSGs as the greatest constraints on the production of sugar cane in that area. This study tried establish if production costs were higher than the output among small scale cane farmers in Malava Sub-County.

Livingston *et al.*, (2011) in Africa, in a study about the state of small holders in agriculture revealed that cane production was constrained by, the lack of improved varieties with drought tolerance, restricted access to credit to acquire inputs and farm processing equipment limited sugarcane production and productivity under small-scale farming systems. The scholar added that there was insufficient funding for research and extension. Waugh, (2009) argued that, however favorable the physical environment may be, once human resources are applied to it, it is of minimal benefit. This applies resources to increase income, such as transport, capital and market, Waugh adds. Yet these resources are often available only in developed Countries; a likely problem in Malava which is found in a developing country Kenya.

Another African nation running sugarcane farming is Nigeria. Girei *et al.*,(2012) in their study about analysis of the factors affecting cane production under the out growers

scheme, pointed out that farmers have faced different challenges in sugarcane farming, leading them to conclude that farmers should be provided with timely agro-inputs/mechanical services as well as adequate irrigation water. They pointed out that this could increase the operations of farmers, which could lead to higher yields. The researchers suggested that the problems of low cane yield should be resolved through the expansion of the estate farms in order to meet the demand of the processing company in terms of higher quality cane supply and to generate adequate funds for the out-grower farmers. This study aimed to establish to what extent such problems are faced by the small scale sugarcane farmers in Malava Sub-County.

Research by Salaudeen *et al.*, (2017) on the problem of sugarcane production in Nigeria and some Northern African counties, revealed that common problems mitigating the increased production of sugarcane in Nigeria and Northern African countries were: capital requirements, lack of market outlay, high costs of transporting harvested sugarcane to the loading areas, absence of cane growers and technologists. This study tried to find out if the Malava cane farmers were also facing such problems.

Salaudeen *et al.*, (2017) also found that sugarcane planters were not precise in choosing the right cane variety to use in Nigeria and Northern African countries. That, about 65 percent of the majority of cane growers still used local sugarcane land breeds, "the type of chewing" while about 13 percent used mixed varieties. The scholar pointed out that there was one variety in Egypt that had been under commercial cultivation for nearly 40 years, and the experimental trials included other new cultivars. This study tried to establish the cane varieties which are used in Malava Sub-County, are they the local ones "the chewing type" like those grown by majority of cane farmers of Nigeria?

Dangote, (2003) also agreed with Reddy (1998) in the paper presented at the Sugar Forum on Problems and Prospects of the Nigeria Sugar Industries when he pointed out that the production of sugar cane needs quite a large amount as the starting capital for a hectare plantation; of these, 18 percent accounts for planting materials and 14 percent for fertilizer. High interest from commercial banks also discouraged investors from pursuing loans to set up capital-intensive and labor-intensive sugar cane plantations and sugar plants. The current study in Malava Sub County tried to access if the cane farmers face the problem of starting capital for their cane plantations.

Unlike Brazil, where commercial cultivation is practiced, Sharpe (1998) at Illinois University, the U.S. about “Sugarcane; past and present” found that most cane growers, particularly smallholder farmers, still use hoes and machetes for land preparation. Might this have happened in Malava? Sharpe also revealed that very few farmers employ mechanical land preparation, possessing large planters with machinery. The scholar added that, available units were not sufficient to serve small farmers in the neighboring area and were not big enough to accommodate the sub-soiler. This study tried to find out the equipment used on farms for land preparation in Malava Sub-County.

According to Tena *et al.*, (2016) a study in kenya on farmers preferred traits, constraints and genetic resources; It was revealed that lack of improved varieties with drought tolerance, limited access to credits to acquire inputs and farm processing and extension support were reported to be important constraints to sugarcane production. This study tried to find out if Malava sugarcane farmers were also facing such Problems.

Langat (2015) in a study about farmers struggling in problematic sugar industry, pointed out that according to Michael Arum, a coordinator at Sugar campaign for changes (SUCAM), there was an arbitrary falsification of deduction of farmers’ statements and

weighbridge records going on in sugar millers in Kenya and therefore condemning the cane farmers to life poverty. Furthermore, the scholar noted that faced with high costs of production and delayed payments for their harvest, Kenya's sugarcane farmers had vowed to uproot the cane. Could these problems also be facing the Malava cane farmers? This study tried to establish it.

The Waswa, *et al.*, (2012) study on contract sugarcane farming, where more land is put into agriculture than the rest, showed that while sugarcane farming was supposed to increase the living standards of farmers and somehow help reduce poverty, the provinces of Western and Nyanza were still among the poorest regions in Kenya. In addition, the increased competition for jobs in cash crop production will reduce the time women have had to farm livelihoods or to generate alternative incomes. Waswa, *et al.*, added that an equal approach between men and women to labor specialization at the farm could help resolve this dilemma. While the revenue from high-value cash crops such as sugarcane was more than enough to fulfill the basic needs and nutrition requirements of the household, this did not always happen.

Amadala, (2014), indicated that documents seen by the Nation from many farmers in Bungoma, Kakamega, Migori, Homa Bay and other parts of Western Kenya show that farmers are paying highly for cane deliveries to factories, ploughing, furrowing, seeds, harvesting and fertilizer supply among other costs. Langat, (2015), also indicated that the farmers were uprooting the cane and opting for other crops that took shorter to mature and get profit, like vegetables, maize and bananas. According to Andae, (2014), Malava Sub-County is one of the sub-counties in Kakamega County in the western sugar belt from which sugarcane production has been declining; the reason could be among these challenges.

Kweyu (2013) in a study about “factors influencing withdrawal of farmers from sugarcane farming; a case of Mumias sub county” revealed that most of the sugarcane farmers in Mumias Sub County had pulled away from growing sugarcane because of increased costs of inputs, lack of incentives, minimal food and security. Kweyu also found out that the workshops and field days were few and less farmers attended them. This study attempted to find out if such problems are faced by the small scale cane farmers in Malava Sub-County.

The sugar conference held in Kenya, October, (2018) about the “Missing Links to Self-sufficiency in Kenya’s Sugar Sub-Sector”, recommended the following, according to Njuguna *et al.*, (2018); the young professionals in the Productive Sector Department; that to revamp the sugar sub-sector in Kenya and attain self-sufficiency status, challenges should be addressed at farm level and that farmers should be encouraged to take advantage of the government-supported institutions such as the commodities funds which provide input loans at lower interest rates compared to market rates. This study tried to establish if loans were provided in Malava Sub-County.

Akoth (2016), in a study about “socio-economic impact of sugarcane farming on livelihoods and the biophysical environment in Transmara Sub County”, found out that farmers were gradually abandoning growing maize and other indigenous crops, thus causing a looming threat to food security, especially for small scale farmers who committed their entire land to sugarcane, seeing as it could not be intercropped beyond six months without interfering with productivity.

Akoth also found that both the farmers and the millers have benefitted from their contractual obligations; that, subsequently, smaller deductions have been made on farmers near the Industry. The millers also provided fertilizers and seed cane to farmers

at subsidized prices and facilities including agricultural expansion, meetings and seminars, credit facility, harvesting and transportation, according to Akoth. Akoth pointed out, however, that the profit was reduced as the miller benefited from the by-products of sugar cane and farmers only earned from raw sugar cane tonnage. This study attempted to establish if the millers on Malava Sub-County offered the cane farmers with the above services.

Sugar Task Force Report (2020) recorded a decrease in sugar cane in Kenya due to several challenges: sugar production on the farms is low due to weak seeds of long-ripening varieties, smut diseases, high input costs, and delayed payments. The report indicated that sugarcane mature at 18 to 24 months in western Kenya. In comparison, Sudan develops mature cane species early in 14 months.

The Sugar Task Force Report further indicated that, millers had for the last 5 years failed to meet cane requirements due to unavailability of raw materials. Report says, the shortage has been attributed to farmers abandoning cane for other crops due to preferential delays in payment by the millers, with arrears running into millions of shillings. The Sunday Nation (2014) Business report had similar observation when it indicated that Mumias Sugar Company was closed for what the management says is routine maintenance but, in actual sense, it was due to cane shortage. The report noted that the shortage was likely to worsen as farmers were abandoning cane farming. This study attempted to establish to what extent the small scale sugarcane farmers in Malava Sub-County face the same problems.

In summary, the results from the studies of the scholars discussed in this section, show that there are common challenges faced by cane farmers in various areas of the world. This is because similar views were repeated across all their findings. For instance, higher

costs of production/increased costs of input, inadequate extension services to the cane farmers and other credit facilities like herbicides and fertiliser were mentioned as the constraints to sugarcane production by SSGs. Also, presentation of their results was done by use of tables, charts and graphs.

2.5 Theoretical framework

This study was guided by Alfred Weber's (1909) Least Cost Theory of industrial location, in an attempt to explain the economic challenges facing the small scale sugarcane farmers in Malava Sub-County. Weber's theory states that, an industry is situated where raw materials and final product transportation costs were a minimum. Weber's theory addressed Economic-based variables for example, transport, raw materials and market.

According to Alfred Weber, (1909), the Least Cost Theory accounted for the location of manufacturing plant to minimize the three categories of costs, as shown in Figure 2.3

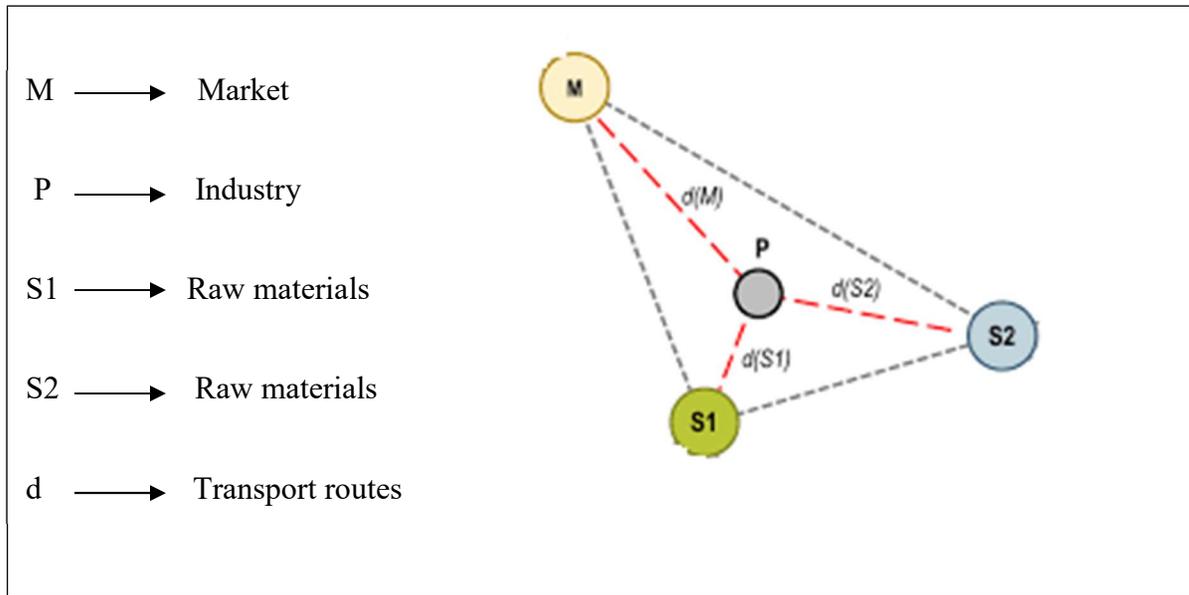


Figure 2. 3: Weber's Location Triangle

Source: Transport Geography organization, 2020.

Weber defined two particular cases; in one case, the finished product weight was less than the mass of the raw material in the manufacture of the product. It was the case of weight loss; in the other case, the finished product was heavier than the transport raw material. This was typically a case of integrating some ubiquitous (everywhere available) raw material such as water into the piece. This was called the weight- gaining case.

This study therefore attempted to establish to what extent the Least Cost Theory of Industrial Location was applicable in indicating the challenges facing sugarcane farming in Malava Sub County. Based on this theory, it was hoped that solutions would be suggested. This, according to Weber was simply because Location Theory addresses questions of what economic activities are located where and why? In this case, Butali sugar, Kabras sugar and sugarcane farms; Malava Sub County Map on Figure 3.1

indicates their sites. The Weberian transport corner in theoretical framework clearly informs the following conceptual framework.

2.6 Conceptual Framework

In this study of the economic challenges facing the small scale sugarcane farmers in Malava Sub- County, there are two key words: Economic challenges (independent Variable) and Sugarcane farming (dependent Variable). According to Kombo, (2016), the conceptual framework indicates the effect of the independent variable (cause) on the dependent variable (outcome). In this study an attempt was made to find out how the economic challenges for instance, problems related to transportation, marketing and the effect of lack of capital equipment, all combined affected sugarcane farming in Malava Sub- County. Thus, sugarcane farming depends on efficient and effective transportation system, marketing system and adequate capital equipment, as illustrated in Figure 2.4 below:

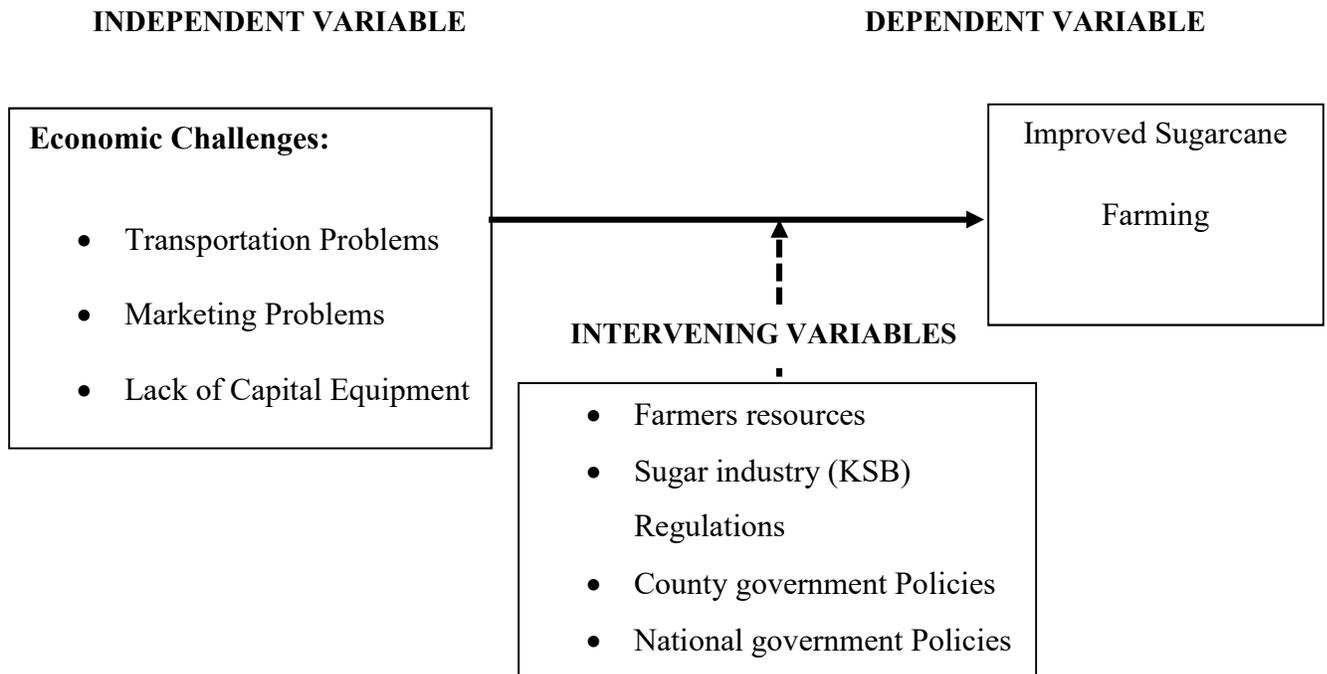


Figure 2.4: Conceptual Framework on economic challenges facing sugarcane farming.

Source: Field Data, 2023

In this chapter, the previous studies by researchers on economic challenges facing sugarcane farming were reviewed thematically according to the study objectives. The theoretical and conceptual frame works were also established. These facts also provided knowledge to the study. The next chapter is going to outline the research methodology of the study.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

In this chapter, Research methodology is outlined giving the framework that was used in the study. It includes study location, research design, target population, sample size and sampling procedures, Data collection instruments, Data reliability and Validity, Data analysis procedures, Basic assumptions and Limitations of the study.

3.2 Study Location

This study was carried out in Malava sub-county Kakamega County in Kenya's Western region. Malava sub-county is located at 0° 26' 49" N (latitude) and 34° 51' 13" E (longitude). Malava Sub County covers an approximate area of 423.3km² in Kakamega County Kenya (Soft Kenya Communications Report of October 5th, 2015). According to information Cradle.Com, (2018), Malava Sub County experiences the various conditions favorable for sugarcane growing: Temperatures range from 20-27 degrees Celsius throughout the year, with dry sunny conditions which are great advantage as they promote sugar accumulation and rainfall ranges from 1200-1500 mm per annum. Malava Sub County has no distinct dry season. There are deep fertile soils which are well drained and the area has undulating flat or gently sloping terrain which allows for mechanization especially in land preparation for instance, ploughing and harrowing.

The study area was chosen because according to Langat (2015), Malava Sub-County is among the Sub-Counties of Kakamega County, in which the fortune of the once flourishing sugar industries has been declining with time, making the farmers to uproot the sugarcane and opt for other crops. Figure 3.1 illustrates the study area.

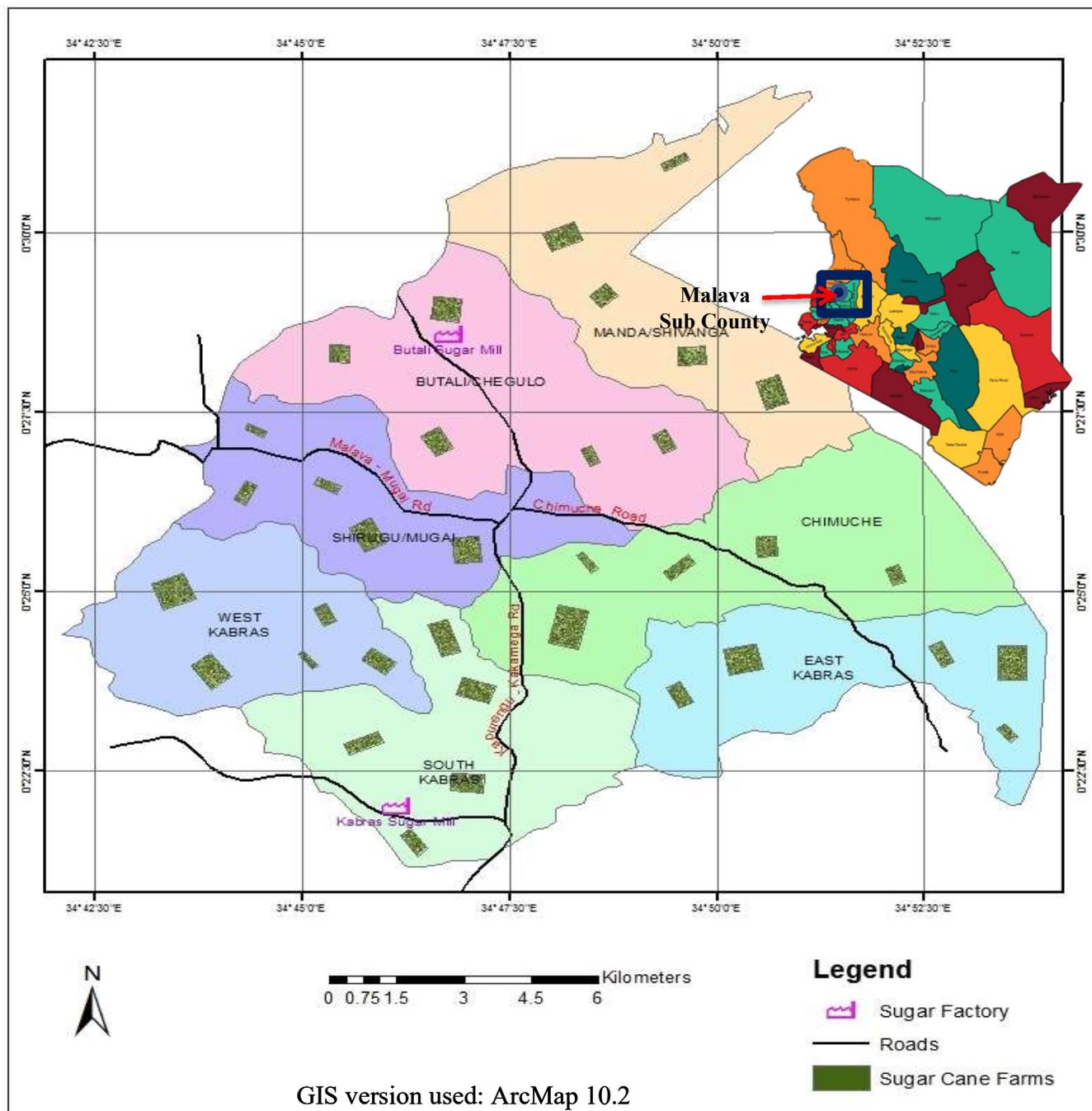


Figure 3. 1: Malava Sub-County Map Showing Cane Plantation.

Source: Field Data, 2023

3.3 Research Design

This study was conducted using descriptive research design. Descriptive research design is a method of collecting information by interviewing or administering a questionnaire to a representative of the target population, Orodho, (2005). In this study, it was used to collect information about farmers' attitudes and key informants in relation to the economic challenges facing sugarcane farming. The design was selected for this study because it describes the collected information as it exists, thus without influencing it in any way. The researcher only reports and interprets the findings.

3.4 Target population

This study was conducted using the target population of 65,323 people. Target population is an entire group of individuals, objects or items that have at least one thing in common from which the sample might be drawn; (Kombo and Tromp, 2016). Table 3.5 indicates that Malava sub-county comprises of seven wards with an approximate population of 65,323 people who engage in cane farming. This is according to the report from Butali sugar and Kabras sugar, about the registered sugarcane farmers contracted to them. The subjects of the study were drawn from all the seven wards. The respondents include sugarcane farmers, sugar factory managers and focused group discussants. This target population was used to draw the sample size for the study. It was also selected for this study because it is important for the researcher to identify and select respondents that answer the questions the research is addressing.

Table 3. 1: Distribution of wards in Malava sub-county

Ward	Population
Manda/Shivanga	32,194
Butali/Chegulo	31,876
Shilugu/Mugai	25,055
Chemuche	29,745
West Kabras	26,114
South Kabras	37,523
East Kabras	22,659
Total	205,166

Source: Field Data, 2023

3.5 Sample size and sampling procedure

Sample size refers to a group of subjects that are selected from general population and is considered a representative of the real population for that specific study. The population of sugarcane farmers in Malava Sub County is more than 10000, as indicated in Table 3.2.

Table 3. 2: The total cane Farmers from the seven wards in Malava Sub County

Ward	Current No. of Cane Farmers	Sample Size
1. West Kabras	10271	61
2. Chemuche	12364	73
3. East Kabras	9321	55
4. Butali/Chegulo	8865	52
5. Manda/Shivanga	7665	45
6. Mugai/Shilugu	6851	40
7. South Kabras	9886	58
Total	65323	384

Source: Field Data, 2019

From this population, the sample size of this study was calculated basing on the formula of Mugenda and Mugenda, (2003) which produced a desired sample size of 384. It is elaborated as below:

$$n = \frac{z^2 pq}{d^2}$$

Where;

n is the desired sample size if the target population is greater than 10000

z is the standard normal deviation at the required confidence level,

p is the proportion in the target population estimated to have the characteristics being measured.

$$Q=1-p$$

d is the level of statistical significance set

Hence the proportion of the target population has certain characteristics of 0.5 the z static is 1.96 and the desired accuracy at 0.5 level, the sample size is:

$$n = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2}$$

$$=384$$

The sample size was used to establish the number of respondents to be interviewed in this study. The sample size of respondents from each ward was selected through proportional sampling allocation technique (Cochran, 1977) as shown below:

$$n_i = \frac{N_i \times n}{N}$$

where;

n_i is the number of cane farmers interviewed in the selected wards

N_i is the total number of cane farmers in the selected wards

n is the sample size for the study

N is the total number of the cane farmers in the area of study

The sample size was selected for this study because of accessibility. According to Kombo and Tromp (2016), an effective population sample is one that is accessible to the researcher. Sampling was preferred in the selection because it saves time and it is also cost saving.

3.6 Sampling Strategy

The researcher used sampling methods in progressive stages. Sampling is a process of choosing a sub-group from a population to participate in the study (Ogula, 2005). Purposive sampling is a technique whereby the researcher purposely targets a group of people believed to be reliable for the study. In this study purposive sampling was used to select individuals to provide information on the variables of interest to the study. Thus, the informants and focus group discussants were sugarcane farmers. Purposive sampling was adopted for this study because it picks up small sample with similar characteristics to

describe some particular sub-group in depth, in this case, small scale sugarcane farmers. Purposive sampling technique was used to select seven wards as study sites.

Systematic random sampling was applied to select the actual farmers to be interviewed in each ward. This decision to use sampling interval systematically until the entire list is used, is said to be systematically random sampling: Kombo and Tromp, (2016). The technique was used in this study to minimize bias and analyze large population.

3.7 Data Collection Instruments

The instruments for data collection included the use of interview schedules, Focus Group Discussion Guides, observation checklists, questionnaires and document analysis to collect both primary and secondary data.

Questionnaires were prepared for different groups of the sample population. They were used for the purpose of collecting primary quantitative data. The use of questionnaires was necessary because according to Owens, (2002), it has potential in reaching out to a large number of respondents within a short time. Questionnaires give the respondent adequate time to respond to the items and give well thought out solutions. It also offers a sense of anonymity to the respondent and it is an objective method hence no bias resulting from personal characteristics as in an interview. However, it causes problems when respondents failed to understand and interpret the question properly. Interviews involved oral questioning of the selected people either individually or as a group. In this case, a structured interview was employed to collect data from these respondents. They were used to clarify issues arising from the questionnaires. Interviews go hand in hand with observations. Interview language was chosen conveniently to suit the levels of education of the respondents.

Document analysis involves the study of past records and documentations on certain phenomenon and happenings so as to analyze and make viable conclusions on the trends and happenings. Past records about challenges facing sugar productivity were found in the text books, journal articles, dissertations, task force reports and records in the agricultural extension offices. This saved time since the information was readily available.

The tools which were used for this study are described below and summarized in Table 3.3 below:

Table 3. 3: Summary of Data Collection Tools for the Study.

Study pop. unit	Sampling Method	Sample Size	Data Tool	Collection	Appendix No.
Cane Farmers	Random Sampling	384	Individual Questionnaire		III
Farmers' FGDs	Purposive	10x3= 30	FGD Guide		V
Key Informants Factory Managers	Purposive	6	Managers Interview Schedule		IV

Source: Field Data, 2023

3.8 Data Sources

Primary data was obtained from the sugarcane farmers, factory managers and Focus Group Discussion using questionnaires, interview schedules and observation guides. The tools which were used for this research are described below:

3.8.1 Questionnaires for Farmers

Primary data was collected from a total of 384 sugarcane farmers. The questionnaire (Appendix III) comprised a number of questions that included the variables under study. Some open- ended questions were included to enrich qualitative data.

3.8.2 Interview Schedules/Guides

The tools were designed to get/obtain relevant information from the individuals working in the sugar factories; individuals who regularly interact with the sugarcane farmers with regards to providing guidance and instruction on cane farming and related issues. The qualitative information gathered was used to enrich the data from respondents' questionnaires.

3.8.3 Focus Group Discussion Guide

Focus Group Discussion Guides are the tools that were employed on both the male and female sugarcane farmers in their respective groups. The tools had probing questions that addressed each of the specific objectives corresponding to the variables under study (Appendix V)

3.8.4 Observation Guide

In this study the observation guide had questions that included the variables under study as shown in appendix X1. According to Roller *et al.*, (2015), observation guide is a grid that serves to keep the observer on track towards the set objectives and generally facilitate the data gathering process. It also serves an important purpose of reminding the observer of the key points of observation as well as the topics of interest associated with each objective.

3.8.5 Document Analysis/Secondary Data

In this study, document analysis went on until the study was complete. It entailed obtaining data from secondary sources, like relevant books, journals, government

documents like workshop proceedings, research reports, dissertations and online publications Bowen,(2009).

3.9 Validity and Reliability of Research Instruments

3.9.1 Validity

The validity of instruments that were used in this research was ascertained by the fact that the instruments had been utilized in various other related studies and yielded accurate results as indicated in the literature review. Validity refers to how accurately an instrument measures what it is intended to measure. Also, through consultations with university supervisors, the researcher ensured the content validity of the tools to assess their relevance against the objectives of the study. This was referred to as the expert judgment method of ensuring validity of an instrument (Kothari, 1999). Content validity sought to ensure that the data collected using the questionnaires adequately represented the domains of variables that were to be measured.

3.9.1.2 Pilot Study

A pilot study was conducted in order to test the validity and reliability of the data instruments. The pilot study was done among cane farmers in Luandeti and Chevaywa wards in Matete Sub County who also supply sugarcane to Kabras and Butali sugar millers. The data which emanated from these wards after pilot study helped the researcher to gauge the clarity of questions and statements on the research instruments. This also helped in identifying the problems that the respondents could encounter and to determine if the research instrument could yield the required data for main study. According to Mugenda and Mugenda, (2003), a pilot testing is an important step in research process

because it reveals vague questions and unclear instructions in the instrument. It also captures important comments and suggestions from the respondents that enable the researcher to improve on the efficiency of the research instrument. The test sample was taken among the sugarcane farmers from the wards that were not included in the actual study but were close in characteristics and criteria to the ones that were included.

3.9.2 Reliability

The tools were pre-tested in order to guarantee their reliability. According to Kombo *et al.*, (2016), reliability is a measure of how consistent the results from a test are. Two research assistants were well trained to guarantee effectiveness in the data collection.

Piloted data was used to test for reliability using Cronbach's Alpha. According to Pallant (2011) when using the Cronbach's Alpha value to test reliability, a value above 0.7 was considered acceptable. The results of the piloted research instruments enabled the researcher to determine the consistency of responses to be made by respondents and adjust the items accordingly by revising the document. In planning of this study, appropriate research instrument was prepared. Research instruments were developed carefully to fit the research design and the plan of data analysis so that the data collected facilitate the answering of research questions. The results of the reliability tests were as shown in Table 3.4.

Table 3. 4: Reliability Test Table

Items	Cronbach's Alpha	N of Items
Transportation	0.848	5
Marketing	0.867	7
Capital equipment	0.914	10
Sugarcane farming	0.871	3

Source: Field Data, 2023

Reliability test results indicated that all values of Cronbach's Alpha were above 0.7 as shown in table 3.4, implying that the research instruments used for data collection were all reliable. The Cronbach's values for dependent variable; Sugarcane farming was 0.871. The Cronbach's values for the three independent variables were: Transportation 0.848, Marketing, 0.867, Capital equipment, 0.914. The findings imply that the research instruments used to collect the data was reliable as it surpassed the 0.7 threshold for use in research studies. According to Pallant (2011) when using the Cronbach's Alpha coefficient value to test reliability, a value above 0.7 is considered acceptable.

3.10 Data collection, Analysis and presentation Procedures

The researcher presented authorization letter to the cane farmers, key informants and Focus Group Discussants. Then booked appointments where by the questionnaires were issued and the respondents given time to fill. The researcher and research assistants collected the filled in questionnaires for analysis. After data collection, the completed questionnaires were sorted and checked for completeness and consistency. Quantitative data collected was analyzed by use of descriptive statistics to generate frequencies, means and percentages. This was done by tallying up responses, computing percentages of variations in responses as well as describing and interpreting the data in line with the study objectives. Data was analyzed using descriptive statistics aided by Statistical Package for Social Scientists (SPSS version 22). The study results were interpreted using tables, percentages, means and figures for ease of understanding to determine how economic challenges impacted sugarcane farming in Malava Sub-county.

The data collection, analysis and presentation procedure was illustrated according to the objectives of this study as shown in Table 3.5.

Table 3. 5: Data collection, Analysis and Presentation Procedures

Objectives	Data Collection	Data Analysis	Data Presentation
To assess cane transportation problems that face the small-scale cane farmers in Malava sub-county.	<input type="checkbox"/> Questionnaires <input type="checkbox"/> Interview Schedule <input type="checkbox"/> Observation	<input type="checkbox"/> Descriptive Narrative <input type="checkbox"/> Content Analysis	<input type="checkbox"/> Tables <input type="checkbox"/> Charts <input type="checkbox"/> Graphs
To establish the challenges related to marketing of sugarcane faced by cane farmers in Malava Sub-County.	<input type="checkbox"/> Questionnaires <input type="checkbox"/> Interview Schedule <input type="checkbox"/> Observation	<input type="checkbox"/> Descriptive <input type="checkbox"/> Narrative <input type="checkbox"/> Content Analysis	<input type="checkbox"/> Tables <input type="checkbox"/> Charts <input type="checkbox"/> Graphs
To examine the effect of capital equipment on cane farming in Malava sub-county.	<input type="checkbox"/> Questionnaires <input type="checkbox"/> Interview <input type="checkbox"/> Observation	<input type="checkbox"/> Descriptive Narrative <input type="checkbox"/> Content Analysis <input type="checkbox"/> Descriptive Statistics	<input type="checkbox"/> Tables <input type="checkbox"/> Charts <input type="checkbox"/> Graphs

Source: Field Data, 2023

3.11 Limitation of the Study

The study faced a number of limitations which the researcher tried to overcome as discussed below;

- i. The respondents were suspicious and therefore withheld vital data pertaining to this research. Re-assuring respondents of their privacy was the only way to overcome this and confidentiality of all data collected that they were able to give the information.
- ii. The sample was drawn from Sub-County It may be difficult to generalize the findings of this study to the rest of sugarcane industry challenges. However, However, it still met the minimal numbers for meaningful analysis.

3.12 Basic Assumptions of the Study

- a) Most of the sugarcane farmers were uprooting their crop because of the challenges affecting its production.
- b) The respondents' religion did not affect their cane productivity.
- c) Respondents were aware of the economic challenges faced by small scale sugarcane farmers.

In this chapter, a background of sugarcane farming in Malava Sub-County was briefly described bringing out the various conditions favorable for sugarcane growing in the area. It was also indicated that sugarcane has been the economic backbone and only cash crop in Malava Sub- County from the mid 1970's to date. The target population, the research design and sampling procedures were summarized in a series of tables as well as the data on the sampled cane farmers from the selected wards.

The research instruments in this study were outlined and a summary of the data collection tools tabulated. Validity and reliability of the pretest pilot study were described. It is also indicated in this chapter that; authorization was sought from the Masinde Muliro University of Science and Technology Directorate of postgraduate studies Board Committee to conduct the study. Similarly, authorization to carry out the research was sought from the National Commission for Science, Technology and Innovation.

Finally, two study limitations and ways of overcoming them; basic assumptions of the study and data collection, analysis and presentation procedures are outlined in table 3.8 basing on the three objectives of the study.

The following chapter on results and discussion will point out how sugarcane farming in Malava Sub-County can be improved in the light of these findings.

3.13 Ethical considerations

Ethical considerations entail the researcher ensuring ethical checks. The researcher took into considerations all the ethical issues that were strictly followed such as getting permission while undertaking the research. Research permit sought from the relevant authorities - NACOSTI, respondents was enlightened on the purpose of the study and their consent sought prior to their participation. The researcher protected the identity of the respondents by asking the respondents not to write their names on the questionnaires for the purpose of confidentiality.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 Introduction

This chapter covers the findings and discussions of the results for this study basing on each objective starting with the demographic characteristics of the respondents. The findings of the first objective of the study on transportation of sugarcane after harvesting from the farms to the sugar mills. The findings on objective two; marketing problems. Finally, the findings of objective three; the effects of lack of capital equipment and summary of the findings.

4.2 Demographic Characteristics of Respondents

This section presents the demographic characteristics of the respondents with the aim of establishing the general background of the respondents who participated in the study. It includes; respondent's age, gender, education level and religion.

4.2.1 Respondents by Age

The study sought to establish the range of age of the sugarcane farmers as shown in Table 4.1

Table 4. 1 Respondents by Age

Age	Frequency	Percentage
18-35	80	20.83
36-55	214	55.73
Above 56	90	23.44
Total	384	100

Source: Field Data, 2023

It was found out that both the youth and elderly were involved in cane farming as below:

The respondents that were between the age of 18-35years were 20.83%, between 36-

55years were 55.73% while above 56 years old, were 23.44%. Therefore, from the above findings, it was revealed that the majority of the cane farmers in the study area were between the ages of 36-55 years, which is the most productive age group with active farmers.

4.2.2 Respondents by Gender

This study also sought to find information on the gender of the farmers in Malava sub-county. It was found out as shown in Table 4.2, that out of 215 who represented 56% of the target population were female while 169 which represented 44% were male. Therefore, it was revealed that the majority of the cane farmers in Malava sub-county are women.

Table 4. 2: Respondents by Gender

Variable Option	Frequency	Percent
Male	169	44
Female	215	56
Total	384	100

Source: Field Data, 2023

When asked why the percentage of men was low and yet they are the heads of the families whereby they are expected to be leading in activities that bring about development, they argued that most males have ventured into other projects like brick making and sand harvesting than in cane farming. And that most females lease land in which they do cane farming because according to the respondents, the societal norms around the area of study favor men where men are known to own land; but women acquire it through leasing for an agreed period of time and therefore have contracts with the sugar companies in their own names.

One female interviewee from Butali Chegulo ward had the following to comment;

“Men are impatient, they cannot wait for almost two years for sugarcane to mature before they earn. They go for fast earning projects like sand harvesting.”

Yet another one asserted,

“Most men go to look for jobs in towns and they have left all the farming activities and responsibilities to the women back home.”

4.2.3 Respondents by Education Level

This item was included in the questionnaire to establish the level of education of the cane farmers in Malava sub-county. Table 4.3 shows the research findings:

Table 4. 3: Education Level of Cane Farmers

Variable Option	Frequency	Percent
Primary	70	18.23
Secondary	170	44.27
College	79	20.57
University	65	16.93
Total	384	100

Source: Field Data, 2023

Table 4.3 shows 18.23% of the cane farmers in Malava sub-county have attained primary school education, 44.27%secondary, 20.57%college while 16.93% have attained university level of education. The study revealed that most of the farmers have attained secondary education. This is sufficient for farming since they can read, write and understand the directives and instructions given to them about cane production. This imply that majority of farmers are capable of increasing sugarcane productivity through quick understanding of trainings given on the crop management.

4.2.4 Respondents by Religion

The study also sought to find out the religious life of the cane farmers in Malava Sub-County. From the farmer's questionnaire (Appendix VIII), it was revealed that the majority (85%) of the cane farmers in the sub-county are Christians while a small percentage of them (15%) are Muslims, as shown in Figure 4.1. The smaller percentage of the Muslims was not because the Muslims do not like growing cane but was because the Islamic believers were just few in the sub-county. Therefore, this study established that the respondents' religion did not affect the cane farming.

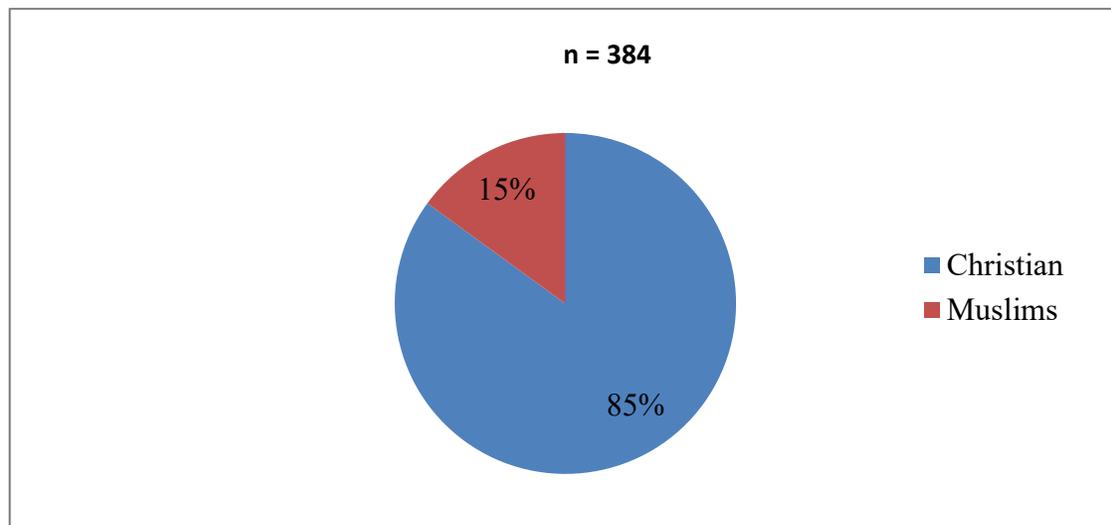


Figure 4. 1: Respondents by Religion in Malava Sub-County

Source: Field Data, 2023

4.3 Transportation Problems Facing Small Scale Sugarcane Farmers

In this section, the data was analyzed to answer the first research question on the problems related to transportation of sugarcane that affected the productivity by small scale sugarcane farmers in Malava Sub-County. The data for this variable was derived from data obtained from the Farmers' Questionnaires, Factory manager's interview

schedule and Focus Group Discussion’s Interview schedule, as discussed in the following sections:

4.3.1 The Distance from Sugarcane Farms to the Sugar Factories

The results indicated that sugarcane farms from the wards that were near the sugar mills had a minimum distance of approximately two kilometers from the mills and a maximum distance of approximately ten kilometers from the sugar mills. For instance, Butali/Chegulo ward near Butali Sugar and South Kabras ward near Kabras Sugar Mills. Other wards: Chemuche, West Kabras and Mugai wards which are abit far from the Sugar mills, showed a minimum distance of approximately eleven kilometers from the millers and a maximum distance of approximately thirty five kilometers, as indicated on Table 4.4

Table 4. 4: Distance of Wards from the Sugar Millers (km)

S/N	Ward	Approximate distance from the millers	
		Min	Max
1	Butali/ Chegulo	2	10
2	Mugai/Shilungu	4	35
3	Chemuche	7	20
4	South Kabras	10	20
5	West Kabras	11	25

Source: Field Data, 2023

4.3.2 Charges for Transportation of Sugarcane after harvesting in Malava Sub County

The following Table 4.5 illustrates how transportation payment was done in Malava Sub-County

Table 4. 5: Transportation Charges of Sugarcane per Ton.

S/N	Sugarcane Zones	Butali Sugar	Kabras Sugar
1	A → (0-10) Km	455	460
2	B → (11-20) Km	455	460
3	C → (21-30) Km	605	460
4	D → (31 – Above)	605	460

Source: Field Data, 2023

The above table indicates that Butali sugar charges Ksh. 455 per tonne in zones A and B, while Ksh. 605 in zones C and D. On the other hand, Kabras sugar indicates the charges being Ksh. 460 in all zones. When the respondents were asked about the above transportation charges their response was as shown on Table 4.6 below:

Table 4. 6: Transportation Charges of Sugarcane to the Sugar Millers

Variable option	Frequency	Percent
High	269	70
Very High	96	25
Average	19	5

Source: Field Data, 2023

The respondents: 70% and 25% who confirmed the charges being high, argued that, this was partly because of poor roads where trucks could get stuck, delaying to deliver the cane on time and also lack of or few bridges which made the distance from cane farms to the mills to be long; leading to farmers being charged the rate of far flung zones, (Ksh. 605 per tonne).

Some FGD discussants were rather unhappy, with the transportation charges by the sugar millers. They had the following to say;

“Exorbitant transport charges per tonne. Sugarcane drops on the way during transportation. I can’t handle this problem, it is beyond my ability.”

Another discussant said;

“There is delay in collection of harvested cane which leads to the cane losing weight and as if that is not enough the transportation is charged per ton.”

He added that;

“Because we have no alternative for now, we are just stuck to cane farming half-heartedly.”

Therefore, this study revealed that transport charges of cane to the millers is high, because of the majority confirming it (70% and 25%) of the respondents. These results concur with the study findings of Chimwai *et al.*, (2011) in Zimbabwe in the reviewed literature, who found out that cane productivity was declining and discovered that the low productivity was largely due to high transport and haulage charges. Similarly, the findings of Paitoon *et al.*, (2016) in Thailand which revealed that transportation costs had been found to be very high in proportion to other variable costs.

These sentiments by the discussants could have been due to losses they incur after the transportation costs were deducted from the payments of their harvested cane. However, data obtained from interview schedule (Appendix IX) indicates that the Kabras sugar mills had made transport charges at a flat rate; Ksh. 460 per tonne (from the closest to the furthest). May be these charges are exaggerated, and that is why the cane farmers term them as high. The respondents (70%; 269) had feelings that the transportation costs be catered for by the sugar millers or be lowered, like it was pointed out by Waugh,(2009)

in the reviewed literature, that transportation costs for bulky goods like sugarcane must be lowered for output to be profitable.

4.3.3 Payment of Sugarcane Cutters and Loaders in Malava Sub-county

The results about the payments of sugarcane cutters and loaders were recorded in Table 4.7.

Table 4. 7: Sugarcane Harvesting and Loading Charges in Ksh. Per Truck

	Harvesting	Loading
Farmer	1200	800
Sugar mills	-	400
Total	1200	1200

Source: Field Data, 2023

The findings of this research revealed that the cane farmers cater for the payments of cane cutters and loaders which is manually done. 100% of the respondents confirmed the use of manual harvesting which they argued that was more expensive. Another comment in form of an example about this, according to one discussant was:

“I am a sand harvester; if my customers buy sand they should ensure that the items reach their destination for use at their own expense. So it is for the sugar millers, they should not charge the cane farmers harvesting fee but pay for the expenses themselves since they are the buyers.”

This finding concurred with what Ahmed, *et al.*,(2015) in their study on assessment of mechanical versus manual harvesting in Sudan found out, when they revealed that manual harvesting is more expensive. Sundara, (1998) had also ranked machine labor second which meant that manual labor was first.

4.3.4 Transportation of Harvested Sugarcane Charged per Ton/Truck

The analysis about this theme was based on the questionnaire data from the farmers, the interview schedule for the factory managers and the FGD information. It was established that the transport services were being charged per ton (Ksh. 455 – 605) as shown in Table 4.5. The farmers' feelings were that it be charged per truck in the meantime as the millers prepare to be meeting the transportation expenses themselves.

FGD discussants reported that cane farmers were being exploited by the millers when they did charge them per ton for transport.

The findings from the interview schedule of the factory managers also indicated that the transportation charges are done per ton. The feelings of the respondents are that the transportation charges be removed completely on the side of sugarcane farmers.

4.3.5 The duration the cane trucks take to unload raw sugarcane at the mills and whoever pays for any extra time

The farmers were asked what they knew about the duration the cane trucks take for the raw sugarcane to be unloaded. They were also asked whoever pays for any excessive time spent at the sugar mills. From the data presented in Figure 4.2, more than three quarters of the sample population (86 %) indicated that it took 5-10 hours, while the rest, about (14%) indicated that it was 20-30 hours.

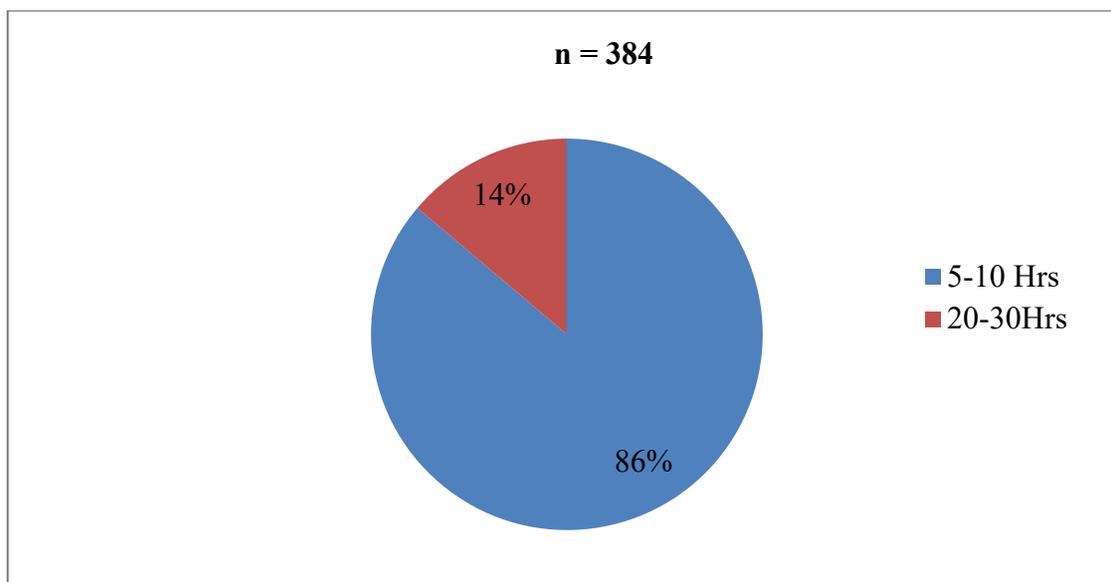


Figure 4. 2: Duration the cane trucks take to be unloaded

Source: Field Data, 2023

When they were asked whoever pays for any excessive time spent at the sugar mills waiting to unload the raw sugarcane, 74.22 % indicated that it was the sugar millers. 10.68% said it was the farmer, while 7.29% indicated that it was the farmer and the miller (shared half each) and 7.81% did not know whether or not the farmer or the miller were responsible for incurring the expenses of excessive time spent. This is illustrated in Table 4.8 below:

Table 4. 8: Payment of excessive time spent at the mills waiting to be unloaded

Variable option	Frequency	Percent
Farmer	41	10.68
Miller	285	74.22
Farmer + miller	28	7.29
Not known	30	7.81
Total	384	100

Source: Field Data, 2023

Forty-one respondents indicated that it was the cane farmers who incur the expenses for any excessive time spent at the sugar mills waiting to be unloaded. They assumed that the payment is included in the deductions made by the millers because most cane farmers as shown in (table 4.6) pointed out the issue of transportation charges being high.

There were focus group discussants who held the view that, the excessive time spent at the millers waiting to unload the raw sugarcane is paid for by the cane farmer.

The same view was repeated across all the wards surveyed. According to another discussant, it was asserted that, the farmers meet the charges as they are included in other expenses to be deducted from the farmer. Another discussant stated:

“Most of the work is done by the farmer, including transport of cane to the miller.”

When the factory managers were asked to elaborate on the issue of delays in transportation and unloading of the raw sugarcane, Butali sugar had the following to say:

“We have ensured that there is no time wastage at our factory by making sure that sugarcane is weighed once delivered and off loaded immediately. We have enough trucks.”

Yet another respondent from the Kabras sugar mills stated:

“There are more than enough trucks to ferry sugar cane from farms; we also allow farmers to transport their own cane privately to the company. Therefore offloading is instant.”

These results contradict with the study findings of Chamnahlaw, *et al.*, (2004) in Thailand, who found out that one of the reasons for high transportation cost was the long waiting line of the trucks to unload sugarcane at the millers, where by each truck could wait for about 20-35 hours on average before unloading sugarcane; then the carrying cost was highly charged to compensate that long waiting time. Paitoon *et al.*,(2016) of Thailand had also revealed in their study that truck drivers might spend upto twenty four

hours for just one transaction, which of course, had an impact on the cost of transportation.

4.4 Marketing Problems Facing Sugarcane Farming in Malava Sub-county.

This section presents the findings on the second objective which was to establish the challenges related to prices of sugarcane faced by Malava cane farmers. The findings were discussed as follows:

4.4.1 Perceptions Regarding the Selling of sugarcane after Maturity

The study found out that majority of sugarcane farmers (55%) were contracted to both Kabras sugar and Butali sugar Mills, (20%) sold their cane to Kabras sugar alone, while 25% sold to Butali sugar alone, (Table 4.9).

Table 4. 9: Selling of harvested sugar cane after maturity

Variable Option	Frequency	Percent
Butali and Kabras Sugar	211	55
Butali sugar	96	25
Kabras sugar	77	20
Total	384	100

Source: Field Data, 2023

It was assumed that the higher percentage of cane farmers contracted to both Kabras sugar and Butali sugar. This is because initially there was only one sugar factory (Kabras sugar) which started in the year 1981, according to the report of the Task Force on recovery of the sugar industry (2018). Most cane farmers were contracted to Kabras sugar until after the year 2007 when Butali sugar began operations. The same farmers shifted and could register different sugarcane farms to either of the companies. The farmers were partly in Kabras sugar and Butali sugar, may be because they wanted to compare the

services rendered by the two sugar companies and find out which one was fair.

4.4.2 Perceptions regarding whether there was Ready Market for the Mature Sugarcane

When asked about the ready market for the mature sugarcane, 60% of the cane farmers responded in the affirmative while 40% responded negatively, that there was no ready market for mature sugarcane. The data is displayed in Figure 4.3.

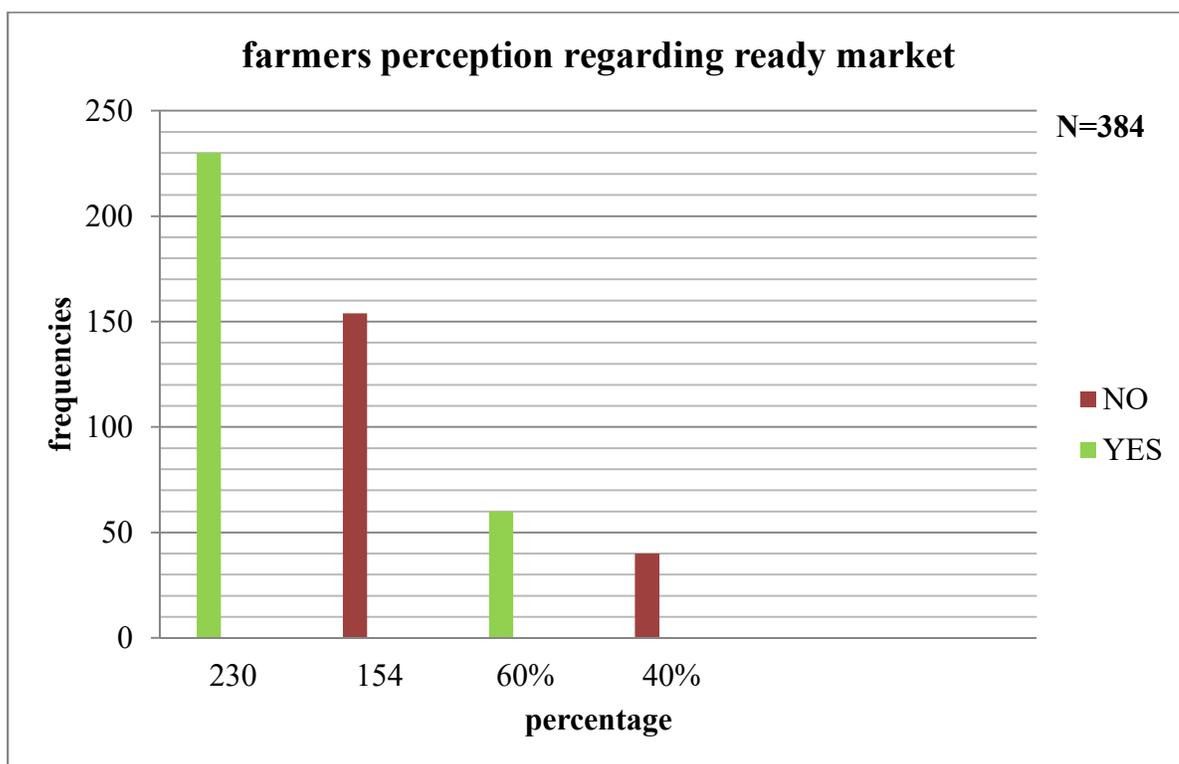


Figure 4. 3: Farmers Perception on Availability of Ready Market for Mature Sugar Cane

Source: Field Data, 2023

The respondents (60%; 230) who said that there was ready market for mature cane also described how it was tedious for one to acquire a permit to

harvest the sugarcane after maturity. They argued that this led to cane being harvested after two years instead of eighteen months and therefore delaying the farmers' plans and operations on their farms.

However, results from (40%;154) respondents who believed that there was absolutely no ready market for mature sugarcane, elaborated on how the sugar millers management made it difficult for one to acquire the cane harvesting permit. They said the supervisors in charge of issuing the permits were corrupt. A member from one of the Focus Group Discussion said;

“You have to keep on visiting the factory many times. You are asked to ‘bribe’ whoever issues the permit. After harvesting one opts to uproot the cane because it is too expensive. No profit.”

Yet another asserted,

“We are forced to bribe the supervisors in order to be given the harvesting permit; at least Ksh. 2000 per permit or sell to the Jaggaries at a throw- away price of Ksh. 35,000.”

Agreeing with the above view, a discussant from a different FGD asserted;

“There is no ready market for mature cane; I usually apply for a permit to harvest my cane which takes a long period to be issued. I keep on bothering the field officers to an extent of even bribing them. It is complicated!”

Table 4. 10: Price of Sugarcane

Butali Sugar (1truck approx. 13tons)	Kabras Sugar (1truck approx.13 tons)	Factory/Jaggery Lorry approx. (13tons)
4050 per ton =52680	3900 per ton = 50700	35,000 per Lorry

Source; Field Data, 2023

Table 4.10 above indicates that the price of raw sugarcane is Ksh. 4050 per ton in Butali sugar and Ksh. 3900 per ton in Kabras sugar. While the price of sugarcane at the factory per lorry of 13 tons is Ksh. 35,000.

These sentiments agree with the cane farmers', response in Figure 4.3, that there is no ready market for mature sugarcane. It can be assumed, from these findings that if a cane farmer does not have money, their sugarcane will not be harvested in time after maturity. This could be one of the reasons why some of the farmers opt to uproot the sugarcane and go for other crops which have ready market after their maturity of short periods. For instance, beans and vegetables as also revealed by Amadala, 2014 in the literature review.

4.4.3 The Duration of payment after sugarcane Delivery to the Millers

Data from the questionnaire's respondents, revealed that the duration taken for a cane farmer to be paid after the delivery of sugarcane to the mills is one week; both in Kabras sugar mills and Butali sugar mills. When the cane farmers were asked whether they were comfortable with that period, the majority (63%) said yes while (37%) responded negatively (Table 4.11).

Table 4. 11: Farmers Perception Regarding One Week's Payment After Cane Delivery

Response	Frequency	Percentage
Yes	242	63
No	142	37
Total	384	100

Source: Field Data, 2023

Those who responded negatively (37%:142) argued that seven days is a long period of time and that the sugar millers sale molasses and Bagasse and therefore should have enough cash to pay farmers at least two days after sugarcane delivery.

Focus Group Discussion across the wards in Malava Sub-County confirmed these findings:

One discussant said,

“The cane cutters and loaders demand payments on the spot; Seven days waiting by farmers is too long. If possible, payments should be immediate.”

“Other crops like vegetables, potatoes, beans and projects like brick making and sand harvesting pay faster.”

Yet other discussants asserted,

“Seven days is long and therefore one cannot use the money to solve an emergency.”

“The payments should be done immediately farmers supply their sugar cane.”

These findings tie up with literature reviewed on Faraz, (2013) in India who found out that farmers complain about sugar millers being unable to purchase their yield immediately. Faraz, (2013) also pointed out that those who grew sugarcane were underpaid in the market despite them being the real producers of the crop, such that the main beneficiaries of any price increase were always sugar millers or processors.

It is also in agreement with the findings of Brenda (2012) on problems facing cane farmers in Kenya which reported that there is delay in disbursing payments to farmers by sugarcane companies. This reduces farmer’s morale and their capacity in carrying out

extensive farming. From the questionnaires' response and FGD discussants, this study revealed that the Malava farmers cane yields are also not purchased immediately.

4.4.4 The Price of sugarcane in Malava Sub- County

This study found out from the farmers' questionnaire data that sugarcane price was determined by the sugar mill owners as indicated on Table 4.10. These payments are based on weight of sugarcane but not sucrose content of the cane. Most farmers expressed how they are affected in their operations on the farms when the price of sugarcane is determined by the weights. They argued that sometimes the millers delay to transport the harvested sugarcane and the more the harvested cane stays on the farms the more it loses weight. Therefore, the farmers end up earning very little.

This study also found out from the respondents that farmers are at times cheated on the net weight of their harvested cane because they are never involved in that process of weighing, they are just told that it weighed such tons. One of the focus Group Discussant said;

“Sometimes it is very difficult to tell if it's true that the allocated tonnage is genuine, because the farmer is not present while the weighing machine is operated; anything fishy can be done; tonnage weighing, should be done in the presence of the farmer and if possible at the farm.”

Yet another asserted,

“We are many a times cheated on the net weight of our sugarcane; We are not sure if the tonnage is true because there are cases of accumulating tons from different farmers and then someone else is paid.”

However, other sentiments of those who said that they are affected negatively when the price is determined basing on the weight of cane and not its sucrose content had the following to comment;

“Sugarcane which has over matured has less weight. This is caused by the delay to issue harvesting permits. As farmers we gain nothing but losses.”

“Most sugarcane has little weight but high sucrose content, hence as a farmer I am paid lowly when the pricing is based on weight of cane; sucrose content should be based on while determining the price.”

“Pricing using weight of cane leads to a farmer earning little. Therefore, discouraging further sugar cane farming; the government should set the price to protect the farmers from being exploited, and they should base on sucrose content of cane.”

These findings resemble those revealed in marketing stages of the cane crop study in India by Faraz, (2013), where it was based on weight of cane instead of sucrose recovery; and that it encouraged inefficiency in cane cultivation, because farmers put less effort in improving their crop quality for high sucrose content. Also, that the delay in transporting the harvested cane led to loss of moisture from the crop, making it lighter and therefore less valuable. These results also concur with the study findings of Chimwai, (2011) in Zimbabwe in the reviewed literature, who found out that low prices were paid for the harvested sugarcane and that these had affected most of the farmers’ operations as they could not pay competitive wages, repair equipment and buy fuel. This study, therefore established that Malava cane farmers are also facing these problems of price determination and delay in purchasing the sugarcane yield.

4.4.5 Evidence of Imported Sugar in Malava Sub- County

The questionnaire information and the FGD, discussants from all the seven studied wards clearly revealed that there are cases of imported sugar in Kenya and in Malava Sub-County. This was also confirmed by the interview schedule for the factory manager information from the two sugar mills in the sub county; Kabras sugar and Butali sugar, that there is importation of sugar whereby they expressed how they are affected by this imports; they asserted;

“The overflowing of imported sugar on the market leads to unhealthy competition, where our local sugar lack market.”

Discussants in FGDs also expressed how they are unhappy with the importation of sugar.

They had the following to say;

“The cartels importing sugar are inside the government, thus hard to eradicate them. They import sugar and pack it in Kabras sugar mills packets. The government should minimize importation by stopping the sugar cartels.”

According to Whittman, *et al.*,(2010), the government has allowed importation of sugar because of trade agreement with other countries, but this has turned into ‘dumping’ of cheap unsafe sugar into our Country.

Other discussants said,

“As a farmer I am discouraged because overflowing of sugar on the market has made the millers not to purchase mature sugarcane on time.”

These findings are in agreement with those revealed in the literature review by Brenda, (2012) that, flooding of markets by cheap imported sugar resulted in unfair competition causing delay in disbursing payments to farmers by sugarcane companies. Baraza, (2017) also revealed that, West Kenya sugar company in collaboration with powerful politicians in government were flooding the country with imported duty free sub-standard sugar in total disregard of standing high court orders banning the same, and that the directors of the company were colluding with powerful politicians in government who also have huge financial stakes in the business making a killing in a country starved off locally produced sugar due to failure to meet the production capacities. This study established that the sugarcane farmers in Malava sub-county are also facing these challenges.

When asked about whether sugar conferences were held in Malava Sub-County or not, the respondents confirmed being not aware of any sugar conference in the Sub-County. This was contrary to the findings of Chamnalaw, *et al.*,(2004) in Thailand, Yang, *et al.*,(2014) in China and Brown, (2012) in Fiji whose findings indicated the evidence of sugar conferences being held there.

4.5 The Effect of lack of capital and equipment in Malava Sub - county

This section presents the results of the third objective of the study which was to examine the effects of lack of capital equipment towards sugarcane farming in Malava sub-county.

In this section, the sugarcane farmers' knowledge on land ownership, cane variety, farm equipment, uprooting old cane, farm inputs and visitation by Agricultural extension officers, are described using the questionnaire data findings, Focus Group Discussion, response from the key informants and document content analysis. These are as shown in the following sections.

4.5.1 Land Ownership of Cane Farmers in Malava Sub-county

The study found out that the majority (43.3%;166) of cane farmers leased land in addition to their own. Nearly a third, (36.6%) practiced cane farming on their own land while (20.1%) leased the land on which they planted sugarcane, (Table 4.12). When asked to expound on how much cane farm they owned/leased, almost 80% of the cane farmers reported as owning 0.5 to 2.5 hectares of land under cane while nearly 20% mentioned about leasing 0.5 to 3.5 hectares of land for cane cultivation.

Table 4. 12Land used for Cane farming in Malava Sub-county

Variable Option	Frequency	Percent
Personal land (A)	141	36.6
Leased Land (B)	77	20.1
A+B	166	43.3
Total	384	100

Source: Field Data, 2023

These findings show that, the cane farmers in Malava Sub-County work in small separate farms which is tedious and expensive moving from one farm to another. From the literature reviewed, it is apparent this is not a strange phenomenon as Waugh, (2009) pointed out that numerous scattered and small fields resulted in moving from distant field to another and that this caused problems of access, time spend and transport cost moving from one piece to another.

4.5.2 The cane variety grown in Malava Sub-County

When asked what cane variety they grow, the study findings showed that it ranged from mid-maturing to late maturing which took 14 months and 18 months respectively. Table 4.13 indicates how the cane farmers mentioned the cane variety they grow. About (32.03%) of the respondents reported that they grew the mid-maturing variety while the majority (67.97%;261) reported as growing the late-maturing variety. These results are in agreement with the findings of Salaudeen *et al.*, (2017) in Nigeria and Northern African countries who found out that sugar cane farmers were not particular in choosing the right can variety to use; that majority of cane growers, about 65% still used local old type of sugarcane, the chewing type.

Table 4. 13: The Sugarcane Variety Grown in Malava sub-county

Variable Option	Frequency	Percent
Early Maturing	0	0
Mid-maturing	123	32.03
Late maturing	261	67.97
Total	384	100

Source: Field Data, 2023

The results as shown in table 4.13 assumed that the two cane varieties mentioned by the cane farmers are the only ones available on the market as seed canes in the sub-county. This finding concurs with the study findings by Wakhisi, *et al.*, (2015) which revealed that cane variety used in Brazil matured as early as 6 months, compared to Kenya's 18 months variety. This indicated that Brazil harvested thrice as Kenya harvested once in the same time frame; thus 18 months. The same applies to Malava Sub-County where majority of the farmers grow the late-maturing variety as revealed by this study, which takes a long period leading to shortage of sugar cane supply in Malava sub-county.

4.5.3 Equipment for operations on the sugarcane farms in Malava Sub- County

The sugarcane farmers in Malava Sub- County were asked about the equipment they use in their operations on the cane farms among them being Jembes, pangas, ox-ploughs and tractors. The findings are presented in Table 4.14. At least 15.10% of the cane farmers in the study area reported that they used tractors to plough/ prepare their cane farms for planting, 79.95% mentioned that they used the locally available equipment on their farms, which included Jembes, pangas, slashes and ox ploughs, while nearly 5% admitted that they used both tractors, Jembes, ox-ploughs and pangas in their operations on cane farms.

Table 4. 14: Equipment for operations on the cane farms in Malava sub-county

Variable Option	Frequency	Percent
Tractors (A)	58	15.1
Jembes, pangas, ox-plough (B)	307	79.95
Both A and B	19	4.95

Source: Field Data, 2023

When cane farmers were asked to expound on why the variation in Table 4.14 occurred, they claimed that it was due to financial constraints that most cane farmers turned to the locally available equipment for example, Ox-plough and Jembes which they could afford. This is because the charges, were not as high as using the tractors as illustrated in Table 4.15. However, they admitted that tractors on the other hand make work on farms easier and faster.

Table 4. 15: Ploughing charges peracre

Variable Option	Locally available equipment	Machinery
Butali	2000	3000
Kabras	2000	3000

Source: Field Data, 2023

Table 4.15 above illustrates the rates of ploughing sugarcane farms per acre in Malava Sub-County. The table indicates that sugarcane farmers spend Ksh. 2000 to plough one acre using locally available equipment while Ksh. 3000 using machinery.

Focus Group Discussants supported this finding when some asserted that not all cane farmers are capable of hiring tractors to plough their farms. Some claimed that for those cane farmers who do hire machinery for land preparation, it costed them most of their income which ended up in losses after cane harvests. These results concur with Sharpe, (1998) study in Illinois University United States who found out that majority of the cane

growers especially small holder farmers still use hoes and machetes in land preparation. Also, that very few farmers who own big farms, employ mechanical land preparation methods.

These findings also agree with what Chimwai, (2011) in his research in Zimbabwe revealed that the equipment that is essential to a sugarcane farmer include: tractor, disk harrows and ploughs for land preparation. Most farmers spent most of their income on hiring equipment, because they don't own tractors, they hired the services of estate tractors or tractors owned by their colleagues. This study also established that Malava sugarcane farmers were facing challenges of availability of equipment and cost of hiring them as shown in Table 4.15.

When the cane farmers were asked about the use of irrigation in cane fields, they said that it was not necessary because the areas where sugarcane is grown in the sub-County are all rainfed. This study finding contrasts with what Kodituwakku, (2013) of Sri Lanka revealed that, sugarcane production was more profitable in irrigated regions which accounted for more than two third of the crop area. It is also contrary to what Hoyle, (1979) had revealed in Sudan where it was found out that, sugarcane is mainly grown under irrigation. Therefore, this study found out that cane in Malava was just grown under natural conditions.

4.5.4 Uprooting old Sugarcane in Malava Sub- County.

The study found that up to (83%;319) of the cane farmers did not uproot their old cane, while about 17% reported that they uprooted old cane (Figure 4.4) old sugarcane should be uprooted because it produces low yield after four and above harvests because it is exhausted.

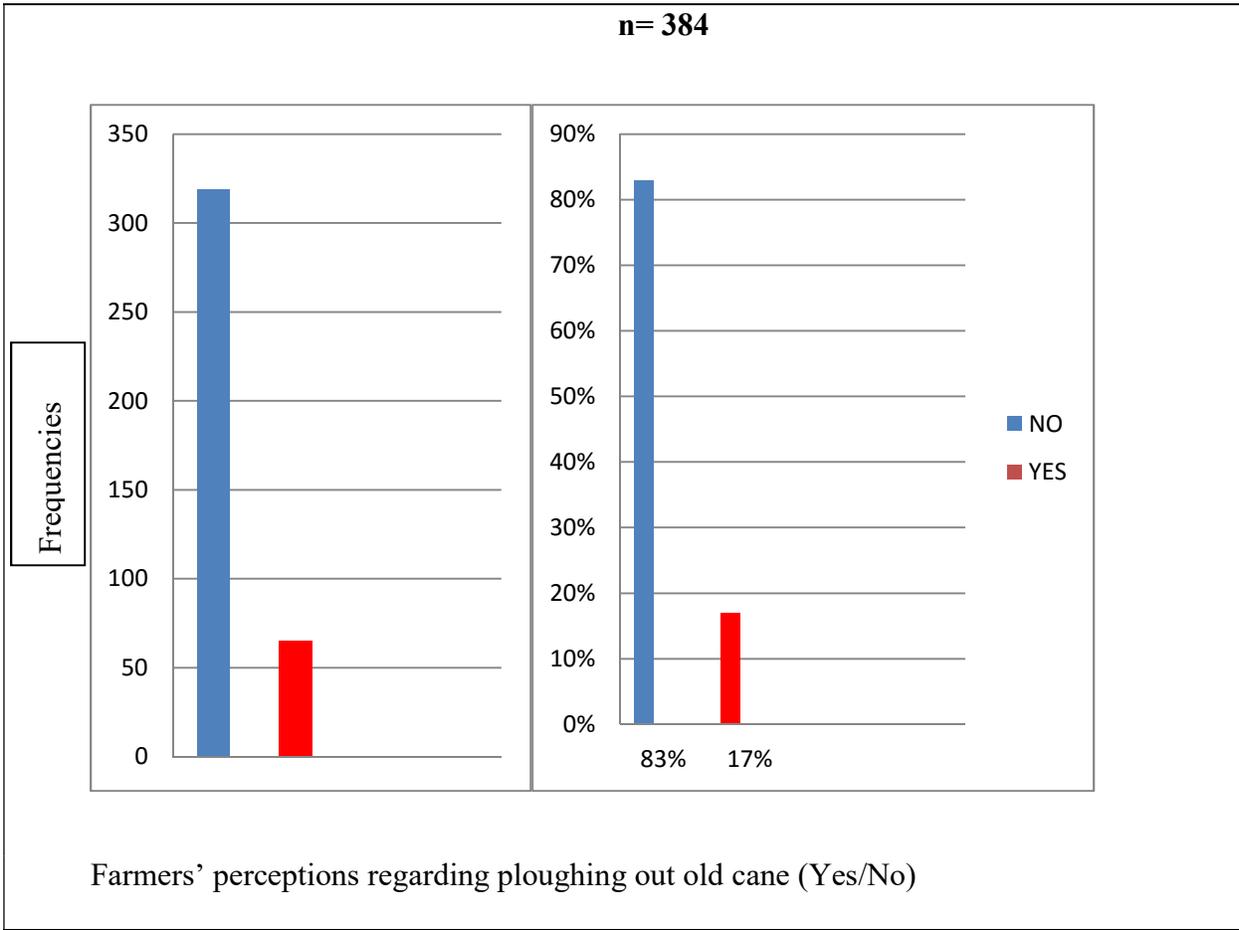


Figure 4. 4: Farmers' perceptions regarding whether or not old cane was uprooted
Source: Field Data, 2023

Cane farmers (83%;319) were asked why they did not uproot old cane. They said that they lacked money to hire the equipment for uprooting the old cane since hiring as shown in Table 4.15 were high according to Malava cane farmers. Therefore, they opted to leave it like it is displayed in a photo (Appendix IV), which was taken from Lurale area in Manda Shivanga ward.

When asked about this phenomenon, focus Group Discussants confirmed what the 83% of the respondents had said 'No' to, though some qualified that it depends on the capability of the cane farmer financially; The 17% who were capable of uprooting old

cane and maintaining their cane farms had some of their farms look like the one displayed in a photo (Appendix V)

However, some discussants pointed out unhappily that,

“Old canes are expensive to maintain and has low weight in tons. I wish we got funding from the millers or government to uproot it so as we plant new ones in order to have good harvests.”

Yet another one asserted,

“It is just expensive to manage and maintain sugarcane; be it a plant or a ratoon.”

These results concur with the study by Chimwai, (2011) who found out that the ratoon age affected productivity; that the ratoon age for most of the farmers in Lowveld was over 15 years. Chimwai also found out that the farmers inherited the cane from the White farmers and never uprooted the cane. The scholar established from the farmers that the major reason for not uprooting old cane was because they were unable to pay for the hiring charges of equipment. He also revealed that old ratoon was the reason for the cane farmers' failure. These results also concur with the finding of Clowes, *et al.*, (1998) who argued that the age of ratoon had an inverse relationship with crop yield, saying that if no new cane was planted, it implied declining trend in productivity. Therefore, this study identified that the Malava sugarcane farmers were also facing the problem of not uprooting the old cane due to high operation cost.

4.5.5 The supply of Farm Inputs by the Millers in Malava Sub-county

Fertilizer, herbicides and cane seeds are all farms inputs required in cane production. About (70%;269) of the cane farmers confirmed being supplied with farm inputs while about 30% reported that they have never been supplied with farm inputs. This is illustrated in Figure 4.5.

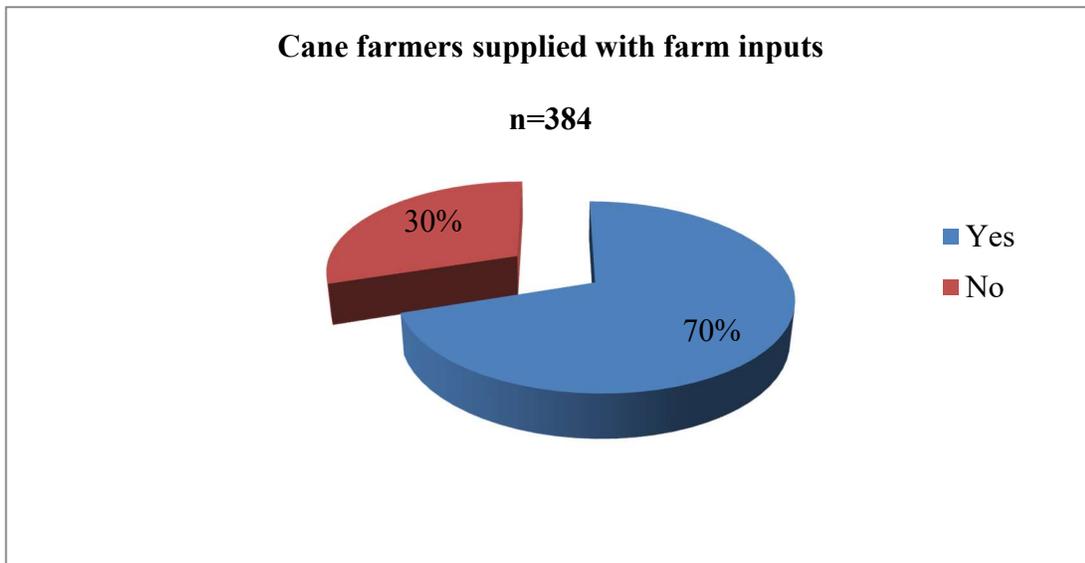


Figure 4. 5: Sugarcane Farmers being supplied with farm inputs

Source: Field Data, 2023

It is assumed in the data shown in Figure 4.5, that the farmers (30%) who were not supplied with the farm inputs either did not apply for them or they were not aware that such services were provided. It was revealed by the 70% respondents that the inputs and services like weeding were given to the farmers who had signed contracts with the sugar millers at a cost of the market price of that time. An interest of 10% was then charged and deducted from the famers’ first harvest. For instance, report from the respondents on how the inputs and services were charged by the year 2018 is illustrated in Table 4.16 below:

Table 4. 16: Charges of Inputs and other services by the year 2018

Variable Option	Rates in Ksh.	Ksh. Per acre
Fertilizer	2 bags of 50kg @ 300	6000
Seed cane	4tons @ 4050	16200
Transport of seed cane	4 tons @ 500	2000
Weeding	6 times @ 3000	18000
Total		42200

Source: Field Data, 2023

From the above Table 4.16, the respondents who confirmed being supplied with the farm inputs expressed their sentiments reporting that the farm inputs are not given as incentives. Instead, farmers pay for them highly as the charges (Total + 10% interest on each input) are made on the first harvest until the cane farmer earned very little. Their opinion was that, the inputs should be given as incentives to cane farmers or be charged half to motivate the farmers.

When asked about chemical ripening, they indicated not being aware of such a practice. While about cane residues being applied in cane fields, they confirmed the application, although they said that they did not follow any formula to apply them on cane farms because they were not directed how to do it.

Focus group Discussants expounded more on the same. Some of them from Butali Chegulo ward in the group displayed on a photo (Appendix VI), said the following:

“The farm inputs like fertilizers, seed cane and services like ploughing provided by the sugar millers are recovered from farmer’s payments for the first harvest of cane through check-off system by the

millers. They charge 10% on total services discharged to cane farmers”

On the contrary, some key informants from Butali and Kabras sugar millers in Malava Sub-County revealed to the study, the following:

“Yes, we do supply seed cane (improved), carry out land preparation and cash advance against sugarcane. We also supply fertilizers, herbicides and offer services like weeding and harvesting advances.”

The reports from the two sugar millers resemble, but they did not mention if the services are given as incentives or at a cost. From these findings it was noteworthy that the farmers who apply for the inputs usually receive them. It was also revealed that the farmers are affected negatively by the exorbitant charges in the name of recovering costs of the aforementioned services provided. Brenda, (2012) study concurs with these findings when she found out that factories in Kenya were fleecing farmers by charging them highly for services extended to them on credit.

This study findings are in agreement with the results revealed in the literature review by Bardhan, (1973), Salaudeen, *et al.*, (2017), Reddy, (1998) and Zhao, *et al.*, (2015) which found out that, even a small piece of land with adequate inputs, one can still be highly productive; but what are critical are inputs. They also found out that great variation existed in most developing countries across years and regions with varying high inputs, high costs of production and low cane price which resulted in low profits for cane growers; they concluded that lower inputs use certainly saved costs but reduced productivity. This study of Malava sub-county also established that the cane growers are facing problems of being charged highly on farm inputs and services offered as indicated on table 4.16. leading to low sugar production.

4.5.6 Farm visits by the Agricultural Extension Officers in Malava Sub-county

The cane farmers were asked how often they were visited by the agricultural field officers. Table 4.17 shows findings regarding how many times cane farmers are visited by agricultural officers.

Table 4. 17: Farm visits by Field Officers.

Variable Option	Frequency	Percent
Rarely visited	334	86.97
Visited often	12	3.13
Not visited	38	9.9
Total	384	100

Source: Field Data, 2023

Table 4.17 indicates that 86.97% of the cane farmers sampled mentioned that they were rarely visited, 9.90% responded that they were never visited, while a small percentage (3.13%) reported that they were visited often. The bigger percentage on the rarely visited row shows that the agricultural extension officers, if they are there, are sleeping on job because they are hardly seen by many cane farmers. These findings revealed that there were cases of cane farmers not visited at all by the agricultural officers as reported by about 9.9% of the cane farmers sampled. This meant that the cane farmers lacked support from the government unlike other governments like Brazil who had a distinct advantage in cane production because her government provided incentives and supported technologies Jerome, (2010).

There were focus group discussants who agreed with the view that the cane farmers are rarely visited by the agricultural extension officers. Some of them said;

“They only come in the field to know cane farmers, register their sugar cane and issue permits where necessary to specific cane farmers.”

“They advise farmers, though not frequent, on best time of planting cane and best seed cane to use. They demand for payment (Ksh. 2000) before harvest permits are given.”

Yet another one asserted,

“Field officers are not there because they do not visit cane farmers on their farms.”

“The support of the government to cane farmers is very little. Cane farmers are getting losses most of the time leading to them pulling out of the activity.”

These findings revealed that the cane farmers who get services from the agricultural extension officers were those who had money. The empty handed lacked the services or got them by luck as they were provided at a cost. The cane farmers in Malava Sub-county need the services to be provided for free, among them include; proper way on how to establish cane plantation/farm, right type of fertilizers to be used and the best seed cane to plant, because the study revealed that most farmers have been growing the late maturing variety since they began cane farming.

Elsewhere the services had been provided for free and an increasing steady rate of cane production had been evident as reported in the background information of this study, Jerome (2010). These results are in agreement with what Tenas *et al.*, (2016) concluded, that lack of improved varieties with drought tolerance and limited extension support were important constraints to sugarcane farming. They also concur with what Wada *et al.*, (2006) findings in China on funding of sugarcane research when it was found out that funding was inadequate.

Similarly, this study found out that the Malava cane farmers also lacked adequate services from the agricultural extension officers, which lead to low sugar production. The behavior of cane farmers in this study remained to be seen under a new scenario of

changing from cane farming to other food crops and poultry farming if the government would not fight for their interests as cane farmers.

In summary, this chapter has described at length the results and discussions of the research findings basing on the three objectives of the study. This study has revealed that there is low sugarcane productivity owing to the economic challenges: transport, market and capital equipment facing the small-scale cane farmers. Summary, conclusion and recommendations of these findings is done in the following chapter.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the findings of the three objectives of the study, and draws conclusions on the same. The chapter closes with recommendation made on policy and further research in the fields of transportation of sugarcane from the farms after harvesting to the millers, marketing of sugarcane/sugar, and the effect of lack of capital equipment.

5.2 Summary of Findings

The first objective of this study was to assess transportation problems that face the small-scale sugarcane farmers in Malava sub-county. This study found out the following: It was established that the distance from cane farms to the sugar factories in Malava sub-county ranged from 2 kilometers to 35 kilometers (Table 4.4). This concurs with Weber's ,1909, least cost theory of industrial location that an industry is located where the transportation costs of raw materials and final product is at a minimum.

It was also revealed that transportation charges were high despite the confession by the Kabras millers that they had made transport charges at a flat rate (Ksh. 460) per ton as indicated in Table 4.5. Cane farmers indicated that the high transport charge was due to lack of enough bridges and poor roads. It was also established that the cane farmers catered for the payment of cane cutters and loaders at rates of Ksh. 1200 and Ksh. 800 respectively per truck (Table 4.7).

This finding was in agreement with results in Baraza *et al.*, (2015) study on the delays in transportation that were related to effect of production costs which was eventually

reflected in the consumer price. Furthermore, transport costs were found to be very high in proportion to other variable costs. This study established from the millers that there was no time wasted by the cane trucks waiting to unload raw sugarcane, since it was instant. What was not well understood here, was how the transportation charges were very high, could there be falsifications of deductions of farmers' statement and weigh bridge records or a kind of exaggeration? This is a gap that calls for further research and careful attention by KSB and other key players in the industry like the KESREF.

The second objective of this study was to establish the challenges related to prices of sugarcane faced by Malava cane farmers. This study found out that the majority of cane farmers were contracted to both Kabras sugar millers and Butali sugar millers as shown on (Table 4.9). Another finding was that there was ready market for mature cane but it was difficult to acquire the permit for harvesting until some cane farmers had to bribe the officials Ksh. 2000/= unhappily, since these were additional costs to farmers that led to losses. This was also confirmed by the cane farmers' views in FGDs. It was also revealed that the duration of payment after cane delivery to the millers was one week, which according to 37% of the respondents was a long period of time. They suggested for at least two days after delivery, because the cane cutters and loaders do demand payment on the spot. It was also found out that determination of producer price of sugarcane is done by the sugar miller owners basing on weight of cane instead of sucrose content. This was seen to be a disadvantage to a cane farmer because sometimes the millers delayed to transport cane and the more it stayed on farms after harvest, the more it lost weight. Furthermore, the study revealed that cane farmers were at times cheated on the net weight of their cane because they were never involved in the process of weighing at millers' weighbridge.

The findings on this objective concurred with those in a study by Faraz, (2013), that the producer price was based on weight of cane instead of sucrose recovery; and that it encouraged inefficiency in cane cultivation, because farmers put less effort in improving their crop quality for high sucrose content. Moreover, it was found out that there are cases of imported sugar in the sub-county.

This was confirmed by the key informants from the two sugar millers in the sub-county who expressed how they faced unhealthy competition which eventually affected cane farmers in their areas of jurisdiction. The findings on objective two, indeed established in Table 4.10 that the prices of raw sugarcane (Ksh. 4050 and Ksh. 3900 per ton) in Butali and Kabras millers respectively affected Malava cane producers and contributed to the low productivity.

The third objective of the study was to examine the effect of lack of capital equipment towards sugarcane farming in Malava Sub County. This study found out that the majority of cane farmers in Malava sub-county leased cane land in addition to what they owned, (Table 4.12). The cane variety grown in the sub-county was identified to be the mid-maturing and late maturing varieties, thus 14 months and 18 months of maturity respectively. It was also revealed by (79.95%;307) of the respondents that the equipment for operations on cane farms were mainly: Hoes, ox-ploughs and machetes amongst others. The tractors, disc ploughs and harrows were also reported being used but by a few (15.1%;51) as shown in Table 4.14, who could afford the high charges (Table 4.15) for the same.

This study also found out that most cane farmers failed to uproot old cane stumps (figure 4.4), due to lack of money to hire equipment for uprooting old cane since hiring charges were high. It was seen in this study that farm inputs like fertilizers, seed canes and

herbicides among others were supplied by the millers at a cost. Whereby 17% of the cane farmers feared to apply for them because they claimed they were expensive compared to those sold in local shops.

Furthermore, this study also established that the Agricultural Extension officers rarely visited the cane farmers, (Table 4.17). Even some cane farmers indicated that the Agricultural Extension Officers were not there because they did not visit farmers, while others pointed out that sometimes the officers' services were free but many times the farmers paid for those services to avoid losses. This meant that the services were done for only those who had money. Efforts to interview some of the officers about the same were fruitless. Such a study is yet to be done in Malava Sub County, therefore it was recommended as an avenue for further research.

The focus group discussants also confirmed this, saying that the leaders were not committed to support cane farmers and that even most cane farmers did not know them, and hence their fate remained unsolved. From the findings of the above three objectives: transport, market and capital equipment, the cane farmers in Malava preferred to venture into projects like brick making, sand harvesting and short-term farming activities like growing vegetables, poultry farming and maize cultivation among others that take a shorter period to mature and earn profits. This finally contributed to low sugar production.

5.3 Conclusions

Productivity in the sugar industry affects the whole nation in terms of foreign currency earnings, production of ethanol, generation of electricity, molasses and other by-products from sugarcane. The success of the sugarcane industry in Malava Sub-County and Kenya in general, is built up on best practices in transportation, marketing and capital

equipment. On the basis of the research findings in relation to the objectives it is concluded that:

- i) The transportation charges of harvested sugarcane from the farms to the mills in Malava sub-county are high (as illustrated on table 4.2) in proportion to other variable costs. Loading stations, which would benefit all the parties, involved thus; growers, truck operators and the millers are proposed as possible solution to the problem. Small scale cane farmers who rely on family labor would be expected to benefit the most from their introduction. Besides this, the government and elected leaders from sugar belts should stop keeping quiet and put in place sound policies, enact legislation and programmes with effective implementation that could help reduce the high cost of cane production in the country.
- ii) There is ready market for mature sugarcane but most of the time the permits for harvesting cane are acquired at an additional and hidden cost; which small scale cane farmers are unhappy with. The duration of waiting for payment after cane delivery to the mills has been observed to be long. The determination of producer price of raw sugarcane is done by the millers basing on weight of cane instead of its sucrose content, furthermore cane farmers are not involved in the process of cane weighing at the factories, therefore not sure of the weights, they are just told.
- iii) The small-scale cane farmers in Malava sub-county are less productive partly because of the poor agronomic practices on the farms: input problems, old ratoon and lack of equipment to carry out activities on time. Thus, farmers in Malava sub-county have vast experience in sugarcane farming but lack the

resources with which to complement their experience. Therefore, the majority opt to withdraw and get involved in other types of farming or means of getting income instantly like brick making and sand harvesting.

The general background of the respondents who participated in this study included: respondent's age, gender, education level and religion. About age of the respondent, it was established that the majority (55.73%;214) of the cane farmers in the study area were between the ages of 36 – 55 years (Table 4.1). Thus, the most productive age group with active cane farmers.

This study also found out that (56%; 215) of the respondents were female. It was established from the FGD's that most men go looking for jobs in towns and that the cane farming activities have been left to women.

Research findings on education level revealed that, most of the cane farmers (44%;170) have attained secondary level of education. This was sufficient for farming since they could read, write and understand easily the instructions given to them about cane production. In addition, this implied that majority of farmers were capable of increasing cane productivity through quick understanding.

The respondent's religion established that the smaller percentage of Muslims (15%) was not because the Muslims do not like growing sugarcane but was because the Islamic believers were just few in Malava Sub-County. Therefore, the study found out that respondent's religion did not affect cane farming.

Finally, research findings of this study would be useful to cane farmers, the community, county planning and the ministry of agriculture. Apart from this, the findings could also be replicated elsewhere in the world, where sugarcane is grown.

5.4 Recommendations

It is recommended from this study findings that:

- i. The millers to meet the transportation costs. The sugar millers to introduce mobile weigh bridges for harvested sugarcane to be weighed at the farm gate before transportation to the sugar millers. This will promote effectiveness and efficiency in the transport department.
- ii. The producer price for sugarcane should be determined by the government. It should be based on sucrose content to motivate farmers to work hard in order to improve productivity and quality of cane. This could also promote efficiency of the sugar millers.
- iii. There should be more involvement of extension workers in rendering expert advice on the cane farming operations to ensure high productivity. The government should consider providing loans to small scale farmers to buy tractors for use within the village, from farm to loading stations and be able to perform other farm operations. The sugar millers should supply fertilizers and other inputs on time and at fair prices to motivate the cane farmers.

5.5 Suggestions for Further Research

This study suggested that further research be carried out in the following areas:

- i. Further research and careful attention on Cane weigh bridge records to help detect and reduce any exaggerations and or falsifications on farmers' statements.
- ii. In-depth research on application of sugar residues for instance Bagasse. Information needs to be availed to improve soil microbe nutrient balance and sustainability for increased sugarcane production.

- iii. Extensive and in-depth evaluation research in all sugar belts to establish the services carried out by the agricultural extension officers; findings for such evaluation would help farmers to improve their cane production.

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APPENDIX I: PLATES



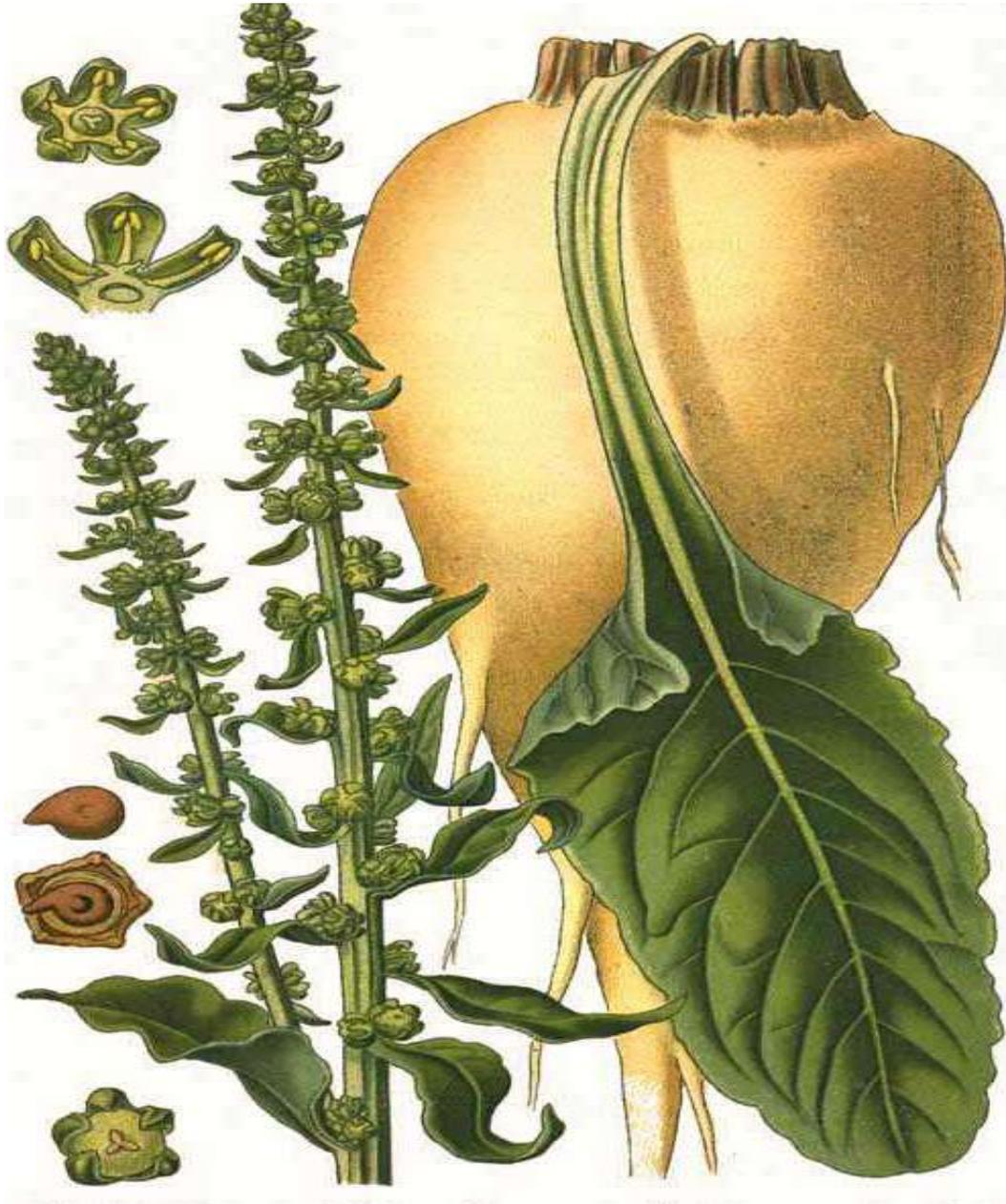
Plate 1: A photo from Lunyu Area, Manda Shivanga ward showing cane plant

Source: Field Data, 2023



Plate 2: A photo from Bunuku Area, East Kabras Ward Showing Harvested cane.

Source: Field Data, 2023



**Plate 3: A Photo Showing Sugar Beet Plant; Adapted from photo library, Nigel
Cattlin Holt Studios International (1996), New York.**

Source: Field Data, 2023



Plate 4: A photo from Lurale Area, Manda Shivanga Ward Showing Poorly Maintained Sugarcane.

Source: Field Data, 2019



Plate 5: A Photo Showing Well Maintained Sugarcane.

Source: Field Data, 2023



Plate 6: A photo from Butali/Chegulo Ward showing focus group discussants.

Source : Field Data, 2023

APPENDIX II: LETTER OF INTRODUCTION

Masinde Muliro University of Science and Technology Department of Social Science
Education, P.o Box KAKAMEGA.

TO WHOM IT MAY CONCERN

Dear Sir/Madam,

RE: REQUEST FOR PERMISSION TO CARRY OUT RESEARCH.

I am a post-graduate student at Masinde Muliro University of Science and Technology currently conducting a study on economic challenges facing small scale sugarcane farmers in Malava Sub-County.

I kindly request for your time to allow an interview/complete the attached questionnaire which can be done at your own convenience. The information you will give is confidential and will be used only for the purpose of this study. The findings will assist in making suggestions aimed at reviving the sugar industry in Kenya. Your cooperation will be highly appreciated.

Thank you in advance.

Yours faithfully,

Nasong'o Nanjala Julita

Masinde Muliro University of Science and Technology.

APPENDIX III: FARMER'S QUESTIONNAIRE

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

Research on economic challenges facing small scale sugarcane farmers in Malava Sub-County.

Dear Farmer,

The purpose of this questionnaire is to establish the economic challenges facing the small scale sugarcane farmers in Malava Sub-County. You are kindly requested to give your opinion and responses to the following items. Your information will be treated with a lot of confidentiality and will be used for only sugar industry development purpose.

Thank you.

SECTION A: Background Information

1. Age (years). Tick where appropriate.
18-35 [], 36-55 [], above 56 []
2. What is your gender? Tick where appropriate.
Male [], Female []
3. Your level of education.
Primary [], Secondary [], University []
4. What is your religion? Tick where appropriate.
Christian [], Muslim [], Any Other [], Specify.....

SECTION B: Transportation Problems

5. State the name of your area/field Zone.
.....
6. How far is your sugarcane farm from the sugar factory?
Approximately.....Km.
7. a) How much is charged for transportation of your cane after harvesting? Tick where appropriate.
Minimum [], Average [], High [], Very high [],
b) If it is very high, what is the government doing about it? And why is it very high?
i)
ii)
iii)
8. a) Who pays the sugarcane cutters and loading of the trucks? Tick where appropriate.
Farmers [] sugar mill owners []
b) How is the harvesting of sugarcane done? Tick where appropriate.
Manually [] Mechanically []
9. a) Are transport services charged per ton or per truck? Tick where appropriate.

Per ton [] per truck []

b) According to your own opinion, how do you find these charges?

.....
.....

10. a) How long do the cane trucks take to be unloaded the raw sugarcane at the mills? Tick where appropriate?

5-10 hours [] 20- 30 []

b) Who pays for the excessive time spent at mills waiting to unload the raw sugarcane?.....

.....

SECTION C: Marketing Problems

11. Where do you sell your sugarcane after harvesting?

.....

12. a) Is there ready market for your cane after maturity? Tick where appropriate?

Yes [] No []

b) If No, how do you go about this problem after maturity of your sugarcane?

.....

13. a)After how long are you paid for the delivered sugarcane to the factory? Tick where appropriate.

One week [], 1Month [], any other []

Specify.....

b) Are you comfortable with this duration?

Tick where appropriate.

Yes [] No []

c) If No, state the reason why you are not comfortable?

i.

ii.

14. a) Who determines the price of sugarcane? Tick where appropriate.

Sugar mill owners [] Government []

b) What do they base on while determining the price?

Weight of cane [] Sucrose content of cane []

c) Do they take the weight of your sugarcane in your presence?

Yes [] No []

d) If No, how do you tell if the weights/tones given to you there after is correct?

.....
.....
e) How does this affect your operations as a farmer?
.....
.....

f) What is your suggestion on how to solve it?
.....

15. a) Are there any cases of imported sugar?

Yes [] No []

b) How are they dealt with by the government?
.....
.....

c) Are any sugar conferences held in Malava Sub – county?

Yes [] No [] Not aware []

SECTION D: The Effect of Lack of Capital and Equipment.

16. How much land do you:

A. Own?.....hectares.

B. Lease?.....hectares.

17. a)What cane variety do you grow? Tick where appropriate.

Early maturing [] Mid Maturing [] Late maturing []

b) Is it the chewable type? Yes [], No []

c) How long does it take to mature? Tick where appropriate.

9 Month [], 12 Month [], 14 Months [], 18 Months []

d) How long have you been growing this variety?
.....
.....

18. a) Which equipment for operations on the farm do you use?
.....
.....

b) Do you apply irrigation on your cane plants at any stage?

Yes [] No []

c) If yes, what method of irrigation do you use?
.....
.....

d) If NO, why do you think it is not necessary?.....

19. a)Do you plough out old cane? Tick where appropriate. Yes [] No []

b) If No, state the reason why?
.....
.....

20. a)Are you supplied with any farm inputs like fertilizer, weedicides and cane seed?

Tick where appropriate? Yes [], No []

b) If yes, do you pay for them or they are given as incentives? Tick where appropriate. Farmers pay for them []. They are given as incentives []

- c) Do you practice Chemical ripening? Tick where appropriate. Yes [], No []
- d) Do you apply any cane residues in sugarcane fields? Yes [], No [], Not Aware []
21. a) How many times are you visited by the Agricultural extension officers? Tick where appropriate.
Rarely Visit [], Visited often [], Not Visited []
- b) Do you receive any funding of sugarcane research and development? Yes [], No []
22. What other economic challenges do you face at farm level?
.....
.....
23. What are the elected leaders doing in support of sugarcane production in your zone?
i.
ii.
24. How is the government supporting the production of sugarcane in your zone?
.....
25. What is your suggestion on how to solve these problems?
- a) Transportation of sugarcane
.....
- b) Marketing of sugarcane
.....
- c) Lack of capital and equipment
.....
26. a) Do you intend to continue with care farming?
Yes [], No []
- b) If Yes, what advice do you give to other sugarcane farmers?
.....
.....
- d) If No, what other type of farming are you opting for and why?
.....

Thank you very much.

Every opinion given is right.

APPENDIX IV: INTERVIEW SCHEDULE FOR THE FACTORY MANAGER

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

**Research on Economic Challenges Facing Small Scale Sugarcane Farmers in
Malava Sub-County**

Dear Manager,

The purpose of this interview is to establish the challenges facing the small scale sugarcane farmers in Malava Sub-County. You are kindly requested to give your opinion and responses to the following items. Your information will be used for only sugar industry development purposes.

Thank you.

1. What is your gender?

.....
.....
.....

2. How long have you been serving as a manager in the current sugar mill?

.....
.....
.....

3. What is the total population of small scale sugarcane farmers registered/contracted to your sugar mill in the last 5 Years?

YEARS	MEN	WOMEN	TOTAL
2013			
2014			
2015			
2016			
2017			
TOTAL			

4. How far is your sugar mill from the sugarcane farms?

.....

5. Are your transportation charges to farmers per ton or per truck?

.....

6. How do you deal with the complains over transportation charges to ensure the farmers are satisfied?

.....

.....

7. Who pays for the excessive time spent by trucks at the mills waiting to unload the raw cane?

.....

.....

.....

8. Do you have enough trucks to transport sugarcane from farms to the mills?

.....

9. What challenges do you face as far as transportation of raw sugarcane from farms to the mills is concerned?

.....

10. Is there ready market for your sugar after processing?

.....

.....

11. Where do you sell your processed sugar?

.....

12. Are there any cases of imported sugar?

.....

13. If Yes, how does it affect your marketing of sugar?

.....

14. How have you dealt with the situation above?

.....

.....

15. What is the government doing about the problem of imported sugar?

.....

16. What do you suggest as a manager concerning problems related to marketing of your product (sugar)?

.....

17. Approximately how many employees do you have?

.....

18. How often do you service your machines?

.....
.....
19. Do you supply farm inputs like fertilizers, weedicides and cane seeds to farmers?.....
.....

20. What other economic challenges do you face at factory level?

.....
.....
.....

21. How do you go about these challenges?

.....
.....

22. What do you think can be done in order to curb these economic challenges?

.....
.....
.....

23. What is the government doing to support the production of sugarcane?

.....
.....
.....

Thank you very much.

Every opinion given is right.

APPENDIX V: GROUP DISCUSSION GUIDE TO THE FARMERS

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

Research on Economic Challenges facing small scale sugarcane farmers in Malava Sub-County

Introduction

The purpose of this interview is to establish the economic challenges facing the small scale farmers in Malava Sub-County. The information which you will give in this interview will be confidential and will only be used for sugar industry development.

Thank You.

1. What is your gender?
.....
2. What is your approximate age bracket?
.....
3. Level of education?
.....
4. How far is your sugarcane farm from the sugar mill?
.....
5. What transportation problems do small scale sugarcane farmers face?
.....
6. How have you been handling these problems?
.....

7. From personal observation and literature search, it has been evident that farmers are uprooting sugarcane and opting for other crops, what do you think might be the cause of this?

.....
.....
.....

8. State challenges related to marketing of sugarcane that you face as a cane farmer.

.....
.....

9. a) How does importation of sugar affect you as a cane farmer?

.....
.....

b) Suggest what you think might be the possible remedies.

.....

10. How do you recover for the inputs like fertilizers and cane seeds and services like ploughing provided by the sugar mills?

.....
.....
.....

11. a) Kindly state the assistance provided by the extension officers and list the services provided.

.....
.....
.....

b) Are these services provided for free or at a cost?

.....
.....

12. What advice do you give to the other cane farmers in order to encourage them, continue growing sugarcane instead of uprooting?

.....
.....
.....

Thank you very much. Every opinion given is right.

APPENDIX VI: OBSERVATION GUIDE

Objectives	Questions for observations	What was observed
<p>1. To assess cane transportation problems that face the small scale farmers in Malava sub – county</p>	<ul style="list-style-type: none"> - How far are the cane farms from the sugar mills? - Does sugarcane drop on the way while being transported? - How long does cane trucks take to be unloaded the raw sugarcane? 	
<p>2. To establish the challenges related to marketing of sugarcane faced by Malava cane farmers.</p>	<ul style="list-style-type: none"> - Is the weight of raw cane taken in the presence of the farmers? - How long does the harvested cane take in the farms before being ferried to the millers? 	
<p>3. To examine the effect of lack of capital equipment towards cane farming in Malava sub county.</p>	<ul style="list-style-type: none"> - What cane varieties do cane farmers grow in Malava Sub County? - Do farmers plough out old cane? - What equipment do cane farmers use on their farms? - Are farm inputs supplied to cane farmers? 	

APPENDIX VII: PROPOSAL APPROVAL LETTER



MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

Tel: 056-30870
Fax: 056-30153
E-mail: dps@mmust.ac.ke
Website: www.mmust.ac.ke

P.O Box 190
Kakamega – 50100
Kenya

Directorate of Postgraduate Studies

Ref: MMU/COR: 509079

Date: 16th May, 2018

Nasong'o Nanjala Julita
GEO/G/08/2016
P.O. Box 190-50100
KAKAMEGA

Dear Ms. Nasong'o,

RE: APPROVAL OF PROPOSAL

Following communication from the Departmental Graduate Studies Committee and the School Graduate Studies Committee, I am pleased to inform you that the Directorate of Postgraduate Studies Board meeting held on 4th May, 2018 at SPD 314 –MMUST considered and approved your Masters proposal entitled: *'The Economic Challenges Facing Small Scale Sugarcane Farmers in Malava Sub-County, Kakamega County'* and appointed the following as supervisors:

1. Dr. Margaret M. Immonje
2. Mr. Wasike Nalianya

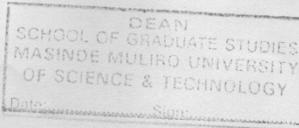
You are required to submit through your supervisor(s) progress reports every three months to the Director of Postgraduate Studies. Such reports should be copied to the following: Chairman, School of Arts and Social Sciences Graduate Studies Committee and Chairman, Department of Geography and Graduate Studies Committee. Kindly adhere to research ethics consideration in conducting research.

It is the policy and regulations of the University that you observe a deadline of two years from the date of registration to complete your Masters thesis. Do not hesitate to consult this office in case of any problem encountered in the course of your work.

We wish you the best in your research and hope the study will make original contribution to knowledge.

Yours Sincerely,


Prof. John Obiri
DIRECTOR POSTGRADUATE STUDIES



APPENDIX VIII: RESEARCH AUTHORIZATION



NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 3310571, 2219420
Fax: +254-20-318245, 318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

NACOSTI, Upper Kabete
Off Waiyaki Way
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/19/44945/27436**

Date: **14th January, 2019**

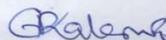
Julita Nanjala Nasongo
Masinde Muliro University of Science and Technology
P. O Box 190-50100
KAKAMEGA

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“The economic challenges facing small scale sugarcane farmers in Malava Sub-County, Kakamega County”* I am pleased to inform you that you have been authorized to undertake research in **Kakamega County** for the period ending **14th January, 2020**.

You are advised to report to **the County Commissioner and the County Director of Education, Kakamega County** before embarking on the research project.

Kindly note that, as an applicant who has been licensed under the Science, Technology and Innovation Act, 2013 to conduct research in Kenya, you shall deposit a **copy** of the final research report to the Commission within **one year** of completion. The soft copy of the same should be submitted through the Online Research Information System.


GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Kakamega County.

The County Director of Education
Kakamega County.

National Commission for Science, Technology and Innovation is ISO9001:2008 Certified

APPENDIX IX: RESEARCH PERMIT

