AN ANALYSIS OF THE SORGHUM-BASED OPAQUE BEER VALUE CHAIN IN ZAMBIA

A Research Report Presented to the Department of Agricultural Economics and Extension of the University of Zambia

By

FAITH M. ADWOKO

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

USAID	United States Agency for International Development
COMPETE	The Competitiveness and Trade Expansion Program
MARKETS	Maximizing Agricultural Revenues for Key Enterprises in Targeted Sites
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
INTSORMIL	International Sorghum and Millet Collaborative Research Support Program
ZRA	Zambia Revenue Authority
PACRA	Patents and Companies Registration Agency
WCB	Workers Compensation Board
ECZ	The Environmental Council of Zambia
ZABS	Zambia Bureau of Standards

ABSTRACT

An Analysis of the Sorghum-Based Opaque Beer Value Chain in Zambia

Faith M. Adwoko
The University of Zambia, 2012

Supervisor:
Ms. P. Hamukwala

Sorghum is a grain crop well adapted to intermittent drought and largely grown in Africa. Four marketing channels identified for it include: food processing; beer brewing; feed processing and energy production. A large proportion of sorghum processed in Africa goes into opaque beer processing. A detailed view of the sorghum opaque beer value chain is looked at in this study using the Porter's model of value chain analysis. This was done through: an assessment of the key players, their functions and the value added at each stage; establishing the amount of locally produced sorghum entering the chain and; identifying rules and regulations as well challenges and opportunities faced by the actors in the chain.

The results showed that the main stakeholders in the chain are the breweries who manufactured the product; the distributors who took up the role of transportation of the opaque beer from the breweries to the retailers and; the retailers who in their outlets sold the beer to the end consumers and also provided sources of entertainment. The traders and small scale farmers played a smaller role in the chain in comparison to the main stakeholders, supplying only 24 percent of the 850.4 metric tons of the sorghum malt used in the industry, while 74 percent came from South Africa and 1 percent from Mozambique. It was noted that the breweries produce an approximate total of 60,434,320 Litres of opaque beer in a year, of which 55,102,320 litres is sorghum-based opaque beer and 5,332,000 is opaque beer without sorghum. Gross margin analysis revealed that the breweries exhibited the highest margins for the different types of opaque beer i.e. packaged sorghum opaque beer - K2068/L of output, unpackaged sorghum opaque beer – K372/L of output and unpackaged sorghum opaque beer - K492/L of output. The most common product sold by both distributors and retailers was Shake Shake produced by National Breweries. Vertical and horizontal linkages in the chain were all strong with the exception of the horizontal linkages for breweries. Most of the rules and regulations in the industry deal with hygiene and price setting by breweries. The major challenges faced by almost all actors of the chain, if not all, that should be addressed include poor information flow in the chain and delays in distribution. The opportunities of this chain include improved quality through sorghum use and expected growth in the industry.

It is recommended that a commodity broker or bulking point be established that channels sorghum or malted sorghum from the small holder farmers to the breweries. A lesson on how to do this could be learnt from Pence Brewery that obtains its sorghum locally and contributions from the other breweries in the chain. It is also recommended that a forum should be created to improve horizontal linkages for breweries and enhance flow of information and access to technology, thereby boosting the productivity of the chain as a whole.

CHAPTER ONE

INTRODUCTION

1.1 Background

Sorghum is a grain crop that grows well in warm climates. It has an average yield of about 0.5 – 0.8 metric tons per hectare with hybrids yielding up to 12 metric tons per hectare (Food Security Department, 1999). As a continent, Africa is the largest producer of sorghum with approximately 21.6 million metric tons produced annually. Leading producers around the world during fiscal year 2010 included Nigeria (11.5 million metric tons), The United States (9.7 million metric tons), India (6.98 million metric tons) and Mexico (6.25 million metric tons) (Chemonics International Inc., 2009).

Sorghum possesses the ability to tolerate and survive intermittent periods of drought and is seen to be one of the most drought tolerant cereal crops currently under cultivation. It offers farmers the ability to reduce costs on irrigation and other on-farm expenses. The International Water Management Institute (IWMI) warns that by the year 2025, 25 percent of the world's population will experience severe water scarcity. However, water productivity in both irrigated and rain-fed acres can be increased through the use of more water-use efficient crops, like sorghum. With the threat of constant changes in climate conditions sorghum production could provide a more reliable and steady income for its growers and perhaps be the answer to the challenge of food insecurity.

Sorghum, in Africa and the world over, is used as a form of staple food as many other cereals are. In Zambia, sorghum ranks second to maize in its importance as a staple cereal while millet ranks third (Hamukwala *et al.*, 2010). It has been used in households to make traditional beers, porridge to feed babies and can also be incorporated in baking of scones and other foodstuffs. Recently, however, its use has been diversified and is seen to include opaque and clear beer brewing, feed concentrates, manufacture of bio-fuels and

fortified food processing (Larson *et al.*, 2010). These various channels of use for sorghum could possibly lead to a higher demand for sorghum which could in turn open up opportunities for producers as well as suppliers of inputs to the sorghum industry (sorghum farmers and traders). The new markets have the potential to provide stability, reliability and higher value that will improve the profitability and income of sorghum farmers. Improved markets will also increase the demand for enhanced production technologies.

The brewing industry that has continued to grow in Africa and Zambia in particular, has the potential to grow further provided the quality of sorghum is improved and appropriate technologies required in the industry are acquired. It also has potential for increased utilization provided supportive policies are put in place. This industry in Africa takes up about 80 percent of the sorghum processed (Mugode, 2009). Both opaque and clear beers are produced in the brewing industry, where opaque beer is priced lower and caters mainly for people in a lower income bracket.

It would be vital to know how sorghum is utilized in each of these potential industries, particularly that of the growing industry of brewing. This would greatly help the production sector in knowing the requirements of the sorghum to be used. A value chain analysis looks at linkages through a production chain with the hope of strengthening them and enhancing productivity. It could, as in the case of a study carried out in Zambia on the value chain of clear beer, provide an opportunity to understand how such an industry could benefit small holder sorghum farmers. The clear beer study showed that introduction of Eagle lager - a clear beer made from sorghum - benefited all the stakeholders involved in the supply chain by providing sorghum farmers with a ready market for their produce and ensured reliable reasonably priced sorghum supplies to Zambian breweries (Chimai, 2011). In addition to this, a value chain in its bid to identify points in the chain that need strengthening in order to enhance production, could improve information availability and increase prospects for further growth of the industry.

1.2 Problem Statement

The diversity in the use of sorghum provides an increasing market for sorghum grain produced. According to Rooney (2010), almost all sorghum produced in Central America is either used for feed (grain and forage for cattle, poultry and swine feed) or food (usually baked foods and other industrial food uses). This too is true for most other countries in which sorghum is produced or is exported to such as China, the United States of America and India (ICRISAT, 2011). Processing of sorghum in Africa is generally low at 2-3% (Rohrbach, 2003; Chemonics International Inc., 2009) due, in part, to lack of an efficient supply chains that are consistent and produce quality grain (Rooney, 2010). This clearly identifies the need to understand the existing and potential value chains for the crop.

Much work has been previously done on how to improve the production side of the value chain and yet very few studies have looked specifically at the different channels or marketing areas through which value can be added to sorghum (Hamukwala *et al.*, 2010). For Zambia, Larson et al. (2006) suggests the possible new market opportunities as energy production, processing of feed and food and, beer brewing. However, each market opportunity was not looked at in detail.

Opaque beer is arguably one of the most important sorghum-based products (Mugode, 2009) whose value chain and chain players need to be understood. According to Leung *et al.* (2002), in southern Africa, sorghum used for human consumption is usually processed to malt for the production of opaque beer. Even though its importance as a market for the sorghum produced has been established, a detailed view of the sorghum-based opaque beer value chains is generally lacking in the literature.

1.3 Objectives

The overall objective of this study is to understand Zambia's sorghum-based opaque beer value chain.

1.3.1 Specific Objectives

Specific objectives of the study are to:

i) Identify key players, their functions, and value added at each stage of the sorghum-based supply chain

ii) Determine the proportion of sorghum grain that goes into opaque beer production in Zambia

iii) Determine the rules, regulations, challenges and opportunities faced by the actors in the chain

1.4 Rationale

The rationale behind study is to increase productivity coupled with efficiency in the sorghum based opaque beer industry. This will help small scale farmers broaden their income generating activities, in view of current intermittent droughts, and increase their income by providing markets for their produce. It will also help breweries enhance their efficiency by providing information about the industry. With efficient production of opaque beer, distributors, retailers and eventually the end user are also at an advantage as more opaque beer can be produced using less resource. The nation as a whole thus benefits as increase in income for the vast majority of small scale farmers and that of the other stakeholders in the chain increases the gross national income of the economy as a whole.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

The following section provides some important literature on the background of sorghum and that of the sorghum industry in Zambia. It also looks at how it is used in the brewing industry with a focus on the opaque beer industry. It further reviews a value chain analysis, breaking it down into its important components through what other researchers have done in and outside Zambia. In this section also is the conceptual framework on which the research is based.

2.2 Background of Sorghum

Sorghum is classified under the grass family Poaceae (or Gramineae), genus *Sorghum Moench.* It is known under various names, e.g. *Milo* in the Middle East, *Kaoliang* in China, *Jowar* in India, *Great millet*, *Guinea corn* or *Feterita* in West Africa, *Mtama* in Eastern Africa, *Dura* in Sudan and Egypt, *Kafir* corn in South Africa and *Mailamucheme*, *Makonga*, *Mabele* or *Chiganigani* in Zambia (INTSORMIL, 2011). Cultivated sorghums are classified into five basic groups or races: *Bicolor*, *Guinea*, *Caudatum*, *Kafir*, and *Durra,* and ten hybrid races which combine the characteristics of any two or more basic races (Snowden, 1936; Evelyn, 1951; Doggett, 1965; Harlan and De Wet 1972 as sited by Leung *et al.*, 2002).

The sorghum kernel is generally spherical but varies in size and shape. It also varies in colour from white through shades of red and brown to pale yellow to deep purple-brown and thus provide another basis for classification i.e. in countries such as the USA (Hikeezi, 2010). Grain colour divides sorghum into the four classes of Sorghum, Tannin sorghum, White sorghum and Mixed sorghum. The most common colours however, are white, bronze and brown.

Cultivated sorghums were domesticated from wild *Sorghum bicolor* around 3000 years ago in the north-east quadrant of Africa (ICRISAT, 2011; Leung *et al.*, 2002). It then spread to different continents of the world and is now widely found in the semi-arid equatorial regions and the semi tropics of Africa, Asia, the Americas and Australia because of its adaptation to adverse environments (Rooney 2010). According to USAID (2009), sorghum is the fifth most important cereal in the world in terms of production, after wheat, rice, maize and barley. It is among the most drought-tolerant of cereals, becoming dormant under drought and heat stress and then resuming growth when conditions improve (Hamukwala et al. 2010; Leung et al., 2002). It can also withstand flooding and is not influenced much by soil acidity. Due to these characteristics, sorghum is a staple food crop for millions of people in the semi-arid tropics of Africa, South Asia and Central America. In Zambia, it is viewed as a traditional crop that is mainly grown in parts which are prone to drought.

During the years of 1999-2003, the largest producers of sorghum included the USA 10.4 million metric tons, India 8.5 million metric tons, Nigeria 8.1 million metric tons Mexico 6.5 million metric tons and Sudan 4.4 million metric tons (ICRISAT/FAO, 1996 as sited by Mugode, 2009). In 2001, of a total of 58 million metric tons produced, the African continent was the largest producer of sorghum producing 19 million metric tons (Leung *et al.*, 2002). However, production techniques applied have not been greatly advanced even though research and innovations to improve production are available. This is partly because there has been a very limited market for the output. It is seen though that recent investment in breweries for sorghum based beer has stimulated interest in the crop. And yields in areas where extension services have been applied by NGOs have increased from less than 500 kg per ha to 3 metric tons per ha in the same location. (Chemonics International Inc., 2009)

2.3 Sorghum Production in Zambia

Sorghum is known as an important grain crop for smallholder sorghum farmers, providing food and an income to sustain them. Sorghum production begins from how the sorghum seed is produced. It requires input from various stakeholders such as the research and development organizations and departments, seed production and certification, seed multiplication and distribution and finally use by the farmers to produce sorghum (Hamukwala *et al.*, 2010).

Researchers and developers are tasked to engineer varieties that address problems of adptability with the environment farmers face as well as those of processing properties required by processing companies e.g. hardness (Hikeezi, 2010). In Zambia, this task is done through the Zambia Agricultural Research Institute (ZARI), Universities and Colleges such as the University of Zambia (UNZA) and the Natural Resources Development College (NRDC) and seed companies such as Seedco, Zamseed etc. Once the seed has been made it is tested and certified for quality assuarance and as a form of regulation by organisations such as Seed Certification and Control Institute. Sorghum seed multiplication and distribution is then done after certification through the varios seed companies, commercial farmers, NGO's and seed traders and it ends up with the farmer who has to use it to produce sorghum grain.

There are various cultivars that have been produced and used by the local smallholder sorghum farmers in Zambia. Some of these include Sima White, MMSH 652 red, MMSH 1040 white, MMSH 740 brown, etc. (Hikeezi, 2010). Sorghum, an extensive and deep rooted crop, is seen to grow well in areas of rainfall ranging between 600 – 1500mm and temperatures of 23°C - 32°C (INTSORMIL, 2011). It is thus grown mainly in Siavonga District of the Southern province of Zambia whose minimum and maximum temperatures are 14°C – 31°C, respectively (Hamukwala, *et al.*, 2010). This district lies in the county's Agro-Ecological Region (AER) I which recieves rainfall of about 800 – 1000mm which is adequate for the growth of sorghum. Sorghum production in Zambia often flactuates between about 0.5 – 0.8 metric tons per hectare (Larson, *et al.*, 2010). Potential end uses

for this sorghum produced have been identifed to include clear and opaque beer brewing, feed concentrates and fortified food processing markets (Larson, et al., 2010).

2.4 Uses of Sorghum in the Brewing Industry

Sorghum grain is mainly used for human food and animal feed. It can be used to make pop sorghum, porridges, pancakes, breads, snacks and alcoholic and non-alcoholic beverages. Locally though, the stalk of sweet sorghum has been eaten and that of other sorghums used to make shelters, roofs, fences, firewood, mats and toys (INTSORMIL, 2011). According to Leung *et al.* (2002), sorghum in southern Africa utilized for human consumption is usually processed to malt for the production of opaque beer and up to 200,000 metric tons of sorghum are processed to malt per annum. Although the malt can be used to produce both clear and opaque beer, the bulk of it is mainly used to produce opaque beer. Generally, the red coloured sorghum is preferred for brewing opaque beer while white coloured sorghum is preferred for lager beer (Hikeezi, 2010).

Opaque beer is a traditional and popular beverage in several countries in Africa. It is also known as *Chibuku* in Zambia and Zimbabwe, *Impeke* in Burundi, *Dolo* in Mali and Burkina Faso and *Pito* in Nigeria. In Zambian rural areas traditionally, the beer is usually brewed for important social and cultural gatherings like weddings, celebrations of success and traditional religious ceremonies, where people buy it in bulk and it is shared amongst them. On a more commercial scale, opaque beer is produced by breweries and sold in bars and taverns that are usually located in compounds (high density living areas) as it mainly caters for people with low incomes.

According to Leung *et al.* (2002), opaque beer is seen to be more of a food than a beverage as shown by the important role it plays in the nutrition of Bantu tribesmen, who work at the diamond and gold mines, as an occasional substitute for meals. This is on the basis that it does not take up the time needed to prepare a meal and in mining industries with long working hours, where time is a limited resource. It also provides a high carbohydrate content similar to that contained in maize of about 70 percent

(INTSORMIL 2011) and so is an appropriate substitute for the meals that have *Nshima* (made from maize meal) as a major part. From this it is seen that sorghum opaque beer is rich in carbohydrate with an alcohol content ranging from 1-4 percent and consumption of 1 Litre opaque beer supplying 13.1 percent daily food energy requirements for an adult. It also contains a considerable amount of protein, each litre drunk supplying about 9.6 percent of the recommended daily dietary allowance for protein. When compared with barley beer, sorghum-based opaque beer has a higher protein, thiamine, riboflavin and mineral content, but a lower alcohol and niacin content (Leung *et al.*, 2002).

Sorghum in the brewing industry is either used in malt form or as adjunct. In most African countries, including Zambia, it is used as malt. Malting can be defined as the limited germination of cereal grains under controlled moist conditions (Briggs, 1998 as sited by Mugode, 2009). The malting process requires the steps of steeping, germination, kilning and finally storage. Sorghum malt plays a role in determining the rate of fermentation of opaque beer. It can also be used for the production of weaning foods and baby foods. On the other hand, adjunct plays an important role to provide extract at a lower cost as a cheaper form of carbohydrate than is available from malt and impart the beer its characteristic viscous body and can be made from either sorghum or maize in opaque beer production.

Opaque beer production involves both lactic acid and alcoholic fermentation stages and takes about 5 to 7 days to brew depending on ambient temperature (Campbell, Webb and McKee, 1997). As its name suggests, it is opaque and alcoholic and also frothing, pinkish-brown in colour with a sour flavour resembling plain yoghurt. Its opaque appearance is due to the high content of suspended solids and cells such as undigested starch residues, yeasts and other microorganisms. This beer is distributed and consumed while still actively fermenting, thus it is held in vented containers so as to allow escape of carbon dioxide. In contrast to clear beer brewing, opaque beer is not pasteurized and it has a short shelf life ranging from one to five days depending on how hygienic the condition is during preparation and fermentation (Food Security Department, 1999).

2.5 Value Chain Analyses

Value chain analyses traces how a product is made, the inputs required and its final use. With this in mind, the actors and the roles played at each stage of production should be looked at. Also, how they are linked to one another, their strengths and weaknesses and the opportunity and threats they face may differ according to the chain analysed are nevertheless all important aspects of a value chain analysis and are reviewed in this sub-section.

2.5.1 Actors and Roles Played

A recent study on Zambia's clear beer industry identified the actors of the brewing industry as sorghum farmers, traders or commodity brokers, processors (malting factories and breweries), distributors and retailers. (Chimai, 2011; Mpagalile and Ballengu, 2011). According to Chemonics International Inc. (2009), sorghum production is an exclusively smallholder activity with a few commercial farmers motivated to join in production due to interest by brewing companies. These smallholder sorghum farmers predominantly rely on sorghum production for their food and farm income. Most households however, have a number of sources of income due to the low productivity experiences in sorghum production as very few of these farmers have applied the technologies and farming practices put out by researchers (Larson *et al.*, 2010). Much of these technologies and farming practices could only be adopted if the smallholder farmers see markets opening for their product.

The next key stage in the chain is that of grain collection from the smallholder sorghum farmers and transportation to the breweries. This can be done though traders and bulking centres. Examples of effective bulking centres for sorghum grain can be drawn from the Eagle lager industry both in Uganda and Zambia. In, Uganda it has been done by engaging the smallholder farmers and the active support of the Ministry of Agriculture and the Agricultural Research Authorities (Mackintosh and Haggins, 2004). In Zambia on the other hand, the commodity broker, CHC, exists as the sole bulking centre for

sorghum grain and is often contracted by Northern Breweries to supply sorghum grain (Chimai, 2011). Looking at literature, such a bulking centre that supplies sorghum grain to the opaque beer brewing industry is not evident.

The manufacturing or processing stage of the value addition process is done by the malting plants and breweries. The malting plants are responsible for malting the sorghum grain while the breweries use up the sorghum malt in producing sorghum-based opaque beer. These two important processing entities act as a market for the sorghum grain produced but require consistent supply of high quality. Larson *et al.*, (2010) terms them as an "important anchor" and possible "change agents" because of the role they play of providing an opportunity to increase smallholder sorghum farmers' incomes through these markets. However, due to concerns of low quality and quantity of sorghum sourced from the smallholder farmers, these processors are forced to import their sorghum inputs (Mpagalile and Ballengu, 2011).

The chain also includes distributors and a number of retailers selling the beer through bars and bottling stores at a price recommended by the breweries (Chimai, 2011). The distributors are responsible for transportation of the sorghum-based opaque beer from the breweries to the retail shops of the retailers. A look at the Eagle Lager value chain in Zambia reveals that it has one brewery with four major distributors, showing it could be a much smaller industry as compared to the sorghum-based opaque beer chain that has at least three major breweries i.e. National Breweries, Midlands Breweries and Capital Breweries. And it would thus be a bigger market for the sorghum produced in the country.

2.5.2 Linkages

A linkage is a connection that the actors at each stage have with other actors in different stages (vertical linkages) as well as within their stage of production (horizontal linkages). A look at the linkages in the chain helps to identify pressure points and make improvements in weaker links where returns are low (Schmitz, 2005 as cited in

Hamukwala et.al, 2010). With linkages strengthened, efficiency in the chain can be enhanced. Strengthening linkages can be done through provision of information and facilitation of communication. This helps to build trust, ensure mutual understanding, loyalty and as a result foster a more efficient, effective and reliable supply chain. (Mackintosh and Haggins 2004).

In some sorghum value chains in Tanzania i.e. sorghum flour and "lishe"- ready to eat sorghum snacks, the sorghum grain traders monopolise the buying of sorghum grain from farmers and often try to block the smallholder sorghum farmers from having direct communication with farmers and processors (Mpagalile and Ballengu, 2011). In Zambia, a look at vertical linkages in the sorghum value-addition chain found that smallholder production relied on linkages with small-scale traders who would consolidate loads for deliveries to breweries or traders following the guidance of traders of whom CHC in Central Province was the main player for its marketing (Chemonics International Inc., 2009). These studies however, do not mention much about the vertical linkages found from the brewers to the retailers in the chain and horizontal linkages throughout the chain which needs to be looked into in order to improve the chain as a whole.

Strong partnerships or relationships with other stakeholders who are not directly involved in the production and manufacturing processes of sorghum are also important. This can be evidenced from the success story of Eagle lager in Uganda where the Government through its agricultural ministry and partnerships with NGO's and private firms, acting as effective and efficient intermediaries, helped by provision of inputs and organization of smallholder farmers (Mackintosh and Haggins, 2004). In Nigeria, USAID/Markets has worked to bring together the stakeholders of the sorghum beer brewing industry to work towards a common purpose of alleviating constraints along the value chain and increasing profits for farmers. With this, it was possible to increase average yields from 0.9 to 1.9 metric tons per hectare in 2008 and increase farmer incomes (USAID/Markets, 2008). This is simply an example of the work that supporting entities such as NGO's do to improve the value chain. However, much still needs to be done to review how these are

involved in the sorghum-based opaque beer value chain and how strong their relationship with the producers and processors are in the chain.

2.5.3 Opportunities and Challenges

Opportunities and challenges faced in the industry have been projected by a number of studies. A look at sorghum production notes that there are quite a number of potential end market opportunities. Particularly, the use of sorghum for production of clear beer on a large commercial scale could increase demand for sorghum for that industry to 3,000 metric tons per annum by 2012 from 1,800 metric tons in 2009. More specifically, the Eagle lager industry's market share is reportedly growing at an annual rate of 5-10 percent which could thus increase demand of sorghum grain (Chemonics International Inc., 2009; Chimai 2011). The opaque beer brewing industry, previously a traditional business but has become commercialized, also offers some opportunities for the production of sorghum. Hamukwala *et al.* (2010) propose that there are some new developments in this market that likely will lead to a rapid growth (10 to 15 percent or more annually) in demand for beer in the future and, consequently, in the demand for sorghum. The study identified the sorghum-based opaque brewing industry as a potential growth area for increase in production though it did not look at this sector in detail.

Sorghum production however has faced some challenges that affect the chain as a whole. Rohrbach, (2003) suggests that some of these challenges include that of lower levels of productivity as compared to commercial grain substitutes such as maize which has led to erratic supply. This inconsistent supply, has led to cases where traders have suffered losses – at times shortfalls of about 2,200 metric tons – after making contracts with smallholder sorghum farmers (Chemonics International Inc., 2009). Other challenges faced include high grain assembly and marketing such as that of search, transportation and storage costs have also proved to increase the inefficiency faced in the chain. Lack of familiarity of commercial food and feed processors with these crops have led to increasing processing costs. In Zambia, it has been seen that processing costs are also generally high due to the unavailability of processing technologies (INTSORMIL, 2011).

Suggestions to improve the industry include provision of tax incentives that would encourage brewers to use domestically produced raw materials and promotion of contract grower schemes initiated by processors which would in turn address the problems related to inconsistent supply. These suggestions would build confidence of the smallholder sorghum farmers in the market rather than a one-off market promise. Also an extension of the Farmer Input Support Programme (FISP) to crops such as sorghum could provide the incentives offered to maize and spur the farmers into the direction of sorghum production.

2.6 Conceptual Framework

2.6.1 Definition of a Value Chain

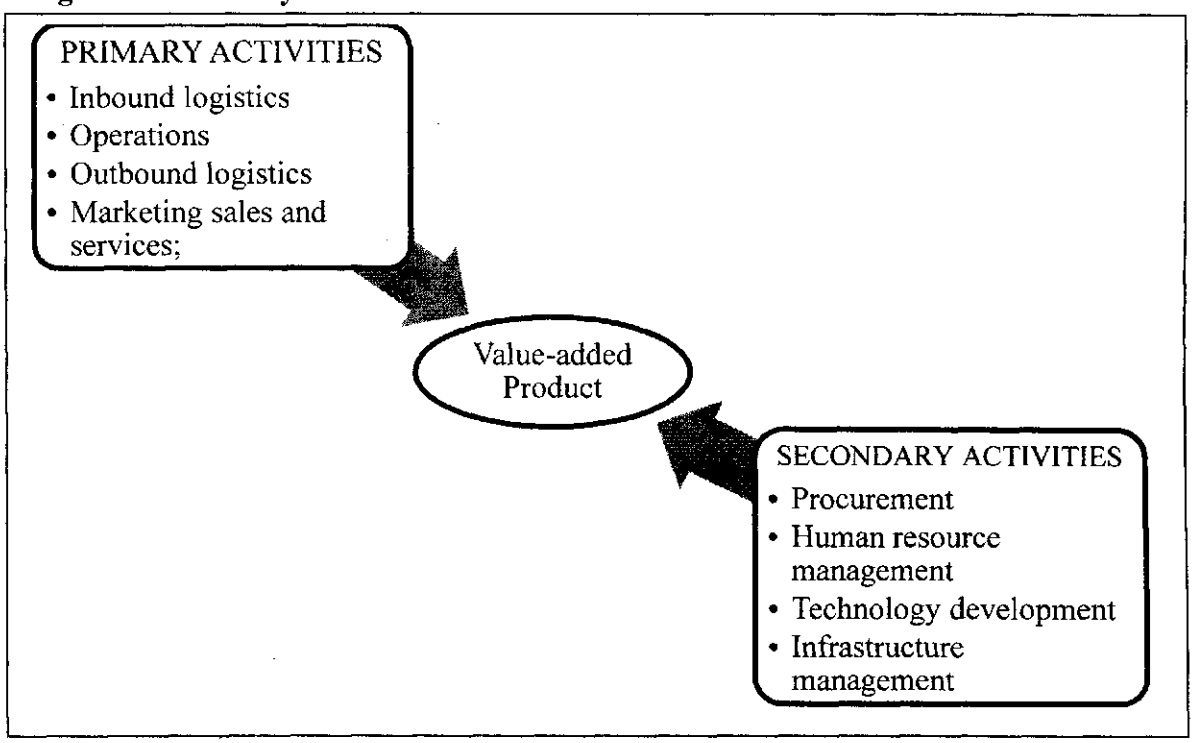
A market of any sort comprises groups of interlinked firms, each contributing to the final product released on the market (Larson *et al.*, 2010). In trying to understand better the dynamics of a particular market, it is important to look at a value chain and how each of the key players involved. A value chain can be defined as a procession of activities for a firm in a particular industry. It relates the value added to a product with the specific order of the chain of activities that it has to pass through before it is characterized as an end product. The product gains value as it passes through each activity and the chain of activities gives the products more added value than the sum of the independent activity's value (Wikipedia, 2011).

At industry level, a value chain can be described as a physical representation of the various processes that are involved in producing goods and services, starting with raw materials and ending with the delivered product (also known as a supply chain). Kaplinsky and Morris (2010) describe the supply chain as the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final consumers, and final disposal after use.

2.6.2 Porter model for Value Chain Analysis

According to the Porter model, a value chain analysis involves identifying primary and secondary activities. Primary activities involve the inbound logistics, operations, outbound logistics, marketing and sales and services; whereas secondary activities involve procurement, human resource management, technology development and, infrastructure management (Chimai, 2011).

Figure 1: Summary of Porters Model



The inbound logistics includes all the activities concerned with receiving and warehousing of externally sourced materials (raw materials) and their distribution to manufacturing industries as they are required. These activities are then followed by operations activities, the processes of transforming inputs into finished products and services (outputs). Outbound logistics are next in the value chain involving the activities which get the output to the buyers i.e. warehousing and distribution of output. Marketing and sales is also important in the value chain. It looks at the identification of customer needs and the generation of sales through informing buyers or consumers about products

and services offered. Last but not least are the service activities which are activities associated with giving support to customers after the products and services are sold to them and thus helping maintain the product performance after the product has been sold.

The primary activities are complemented by the secondary activities. Firstly we have procurement which is concerned with negotiating and purchasing inputs such as materials, supplies and equipment from suppliers. Human resource management activities are also support activities that look into employee recruiting, hiring, training, development, motivation, rewarding and compensation. Technology development activities are activities that focus on managing technologies that support value creating activities, information processing and how "knowledge" is protected in the business. Finally the infrastructure support activities are those concerned with planning, organizational structure, control systems, company culture, etc.

2.6.3 Importance of Sorghum-Based Opaque Beer Value Chain Analysis

A value chain analysis will trace a product – and the inputs used to make it – from its source (input supplier) to its final destination (end user). This enables the members of the value chain to manage risk associated with demand and supply. It does this by providing an assured source of market for the producers of inputs and a traceable line for buyers as to where the product is from (Hamukwala *et al.*, 2010). In the sorghum-based opaque beer value chain, the smallholder sorghum farmers will be able to get an assured market for their produce, while the breweries are able to trace the product to the supplier in case of quality or quantity defaults.

An important step from the Porter model is that it breaks down an organization into its key activities under each of the major components of the primary and secondary activities (Porter, 1985). This is done along the chain at the different stages of production e.g. sorghum production, brewing, distribution, etc., and allows the challenges being faced to be known. With this valuable information from the value chain analysis, a chain can also be seen to be more efficient in that it will be able to respond faster to challenges faced in

the chain such as inconsistent supply, marketing and assembly costs, transportation delays, quality standards, etc (Rooney, 2010; Rohrbach, 2003). From the challenges faced, various opportunities can also be arrived at to improve the chain.

Another cause to look at the value chain of sorghum-based opaque beer is to improve the welfare of smallholder farmers through increasing incomes (Mackintosh and Haggins 2004). Research has been done to improve quality of the sorghum produced and a value chain on its end market would then assure these farmers of markets for the sorghum they produce. The Breweries could also benefit from locally accessed inputs for their industry which would require less transportation costs provided good infrastructure is available which can only be done when communication channels and flow of information is enhanced (Larson, et al. 2010).

CHAPTER THREE

METHODS AND PROCEDURE

3.1 Introduction

The methodology used in this study was basically that suggested by the Porter model but also included various additions from previous studies (Hamukwala et al, 2010; Larson et al, 2006; Chemonics International Inc., 2009; Chimai, 2011; Wikipedia, 2011; Porter, 1985). The Porter model analyses a value chain by identifying primary and secondary activities. Primary activities include: the inbound logistics, operations, outbound logistics, marketing and sales and services; whereas secondary activities involve procurement, human resource management, technology development and, infrastructure management.

In this study the primary activities of the Porter model were helpful in collecting the valuable information needed to address the objectives. Specifically the inbound and outbound activities helped in identifying the key players i.e. sources of inputs and destinations of the output and, determining the proportion of sorghum grain entering the opaque beer value chain. The value added and functions performed by each player and at each stage was also determined by these two activities but also by sales and services activities. Secondary activities such as human resource management, technology development and infrastructure management assisted in isolating the rules and regulations set and faced by the sorghum-based opaque beer value chain actors and determining the challenges and opportunities.

This Porter model framework was supported by that of the value chain map. The value chain map is both a conceptual and practical tool which is useful in identifying policy issues that hinder or enhance the functions of the chain and also institutions and organizations providing the services that the different chain actors need in order to make better informed decisions (Hellin and Meijer, 2006 as sited by Hamukwala *et al.*, 2010). In the study the value chain map helped to identify the actors and the type and strength of

linkages in the sorghum-based opaque beer value chain. It was helpful also in summarizing the opaque beer industry by looking at the roles of each chain player and the input-output relationships of key players to one another.

3.2 Data Collection

Both primary and secondary data were considered. Primary data were collected using structured questionnaires administered by research assistants to various key players, while secondary data were gathered from reports of previous studies, stakeholder (i.e. supplier, processer and distributor) documents and internet sources that had previously collected data concerning the research topic.

The questionnaires were structured with the guidance of the Porter model and the Value chain map. Key sections included in the questionnaire include: company identification, inbound logistics, operations, outbound logistics, marketing activities, service activities, information flow, rules and regulations, policies and challenges – which included a sub-section inquiring on ways to improve the industry – and linkages. These sections were included to help address the objectives of the study and to generally understand Zambia's sorghum-based opaque beer value chain. The questionnaires were pre-tested and changed appropriately before administered to the respective respondents.

3.3 Groups surveyed

In order to study the opaque beer value chain, the major groups of players that were examined include: the suppliers of sorghum grain to the processors (traders); the processors (breweries); the distributors and; retailers. According to Chimai, 2011, these were the key players identified for a similar study of clear beer for the brewing industry and would thus be similar in the case of opaque beer. A major focus in the sampling was to include only the actors that were actively involved in the handling of sorghum and its output, sorghum-based opaque beer.

The population of the players in each group in the area was not known especially that not much research had been done on the industry that captured both packaged and unpackaged sorghum opaque beer. Thus, snowball sampling was used. That is a sampling procedure in which known players in the chain were asked to identify other players that they knew who were then identified for interviews. Larson *et al.* (2010) concluded in a report on market development that processors (breweries) are the most important anchor in the value chain hence the major breweries were identified and targeted as the first that the questionnaires were administered to. Besides asking the questions on the questionnaire, they were also asked to help identify their competitors and distributors as well. This was done continuously with the different breweries and distributors who also identified the retailers they sold to.

Using the snowball procedure, knowledgeable individuals including 4 traders and representatives from 11 breweries, 25 distributors and 55 retail shops were interviewed using structured questionnaires. The only traders found to be selling sorghum after visiting various markets and asking the various stakeholders were the four found at Soweto market. For the breweries, 7 were found that used sorghum in their production but an additional 4 were included in the sample in order to determine why sorghum is not used by these breweries and any other differences. The 25 distributors questioned were arrived at by information provided by the breweries as to who distributed the opaque beer they produced. And the 55 retail shops were identified through the distributors who provided information on their larger buyers. Some retail shops were not interviewed as they were not willing to divulge the information required for the survey. A total of 95 questionnaires were filled out.

With information from these groups, it was also be possible to identify the various other supporting entities to the value chain such as information providers and regulatory bodies. These were not interviewed because as mentioned earlier the research focused on the actors of the chain that were actively involved in the handling and production processes of sorghum. Their contribution to the chain was however, noted.

3.4 Study Location

The study was carried out in Lusaka province. Lusaka province houses the capital city, Lusaka city, of the country which is a hub for many business ventures. Due to this it has a large market potential and hence a number of breweries, distributors and retailers have been established there.

To verify this, consultations with a key informant from National Breweries revealed that most of their competitors and distributors were mainly found within the province. The National Breweries (Natbrew) is one of the major breweries producing packaged sorghum-based opaque beer whose headquarters is found within the province. Natbrew was the first local company to produce packed sorghum-based opaque beer (Chibuku). Also information from previous researchers such as from clear beer value chain analysis indicating that Lusaka had a number of breweries that produced opaque beer, helped identify the province as a suitable place to carry out the study.

3.5 Estimation strategy

Data entry and cleaning was done using the Statistical Package for Social Sciences (SPSS) while much of the data analysis was done using STATA. This was complemented by the use of Microsoft Office Excel in order to create comprehensive tables and charts. Analysis involved generation of important descriptive statistics, cross tabulations and mean comparisons. For the study, the particular strategy and selected analyses were chosen in order to best describe the opaque beer value chain.

The section on information flow and additional information from the knowledgeable individuals on the same (noted down by the research attendants), were summarized and used to identify the actors of the chain. The inbound and outbound logistics sections gave valuable information pertaining to the characteristics of the actors and the gross margin analyses carried out at each stage of the chain.

The gross margin analysis was done to compare different industries that were performing the same roles but using different inputs by using the cost of inputs and outputs. The formulas used were:

$$\text{Gross Margin} = \text{Output Cost} - \text{Input cost} \quad (1)$$

Where:

- Output cost was the price or cost of the product sold by each actor;
- Input cost for breweries producing sorghum-based opaque beer included the cost of the major input – sorghum malt and costs for other major inputs used in production such as maize meal, yeast and enzymes and;
- Input costs for traders, distributors and retailers included cost of their major input i.e. sorghum grain for traders and opaque beer for distributors and retailers.

$$\text{Average Gross Margin} = \frac{\sum_{i=1}^{n} \text{Gross Margin}}{n} \quad (2)$$

Where:

- n is the total number of actors observed;
- i is the individual observation and;
- Profit margin is as obtained from equation (1).

From the collected data, summaries of rules and regulations, challenges faced and ways of improving the industry were obtained from the various sections headed by similar titles in the questionnaire. Cross tabulations were performed on the data collected in the linkages section of the questionnaire to come up with a summary of the strength of the linkages in the sorghum-based opaque beer value chain.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents and discusses the study findings. It begins with the identification of the actors and outlining their characteristics. It then looks at the gross margins at each stage of production comparing across various categories of actors. The chapter also discusses rules and regulations, challenges faced and the suggestions offered by each group of actors for improvement of the chain.

4.2 Identification of the Actors

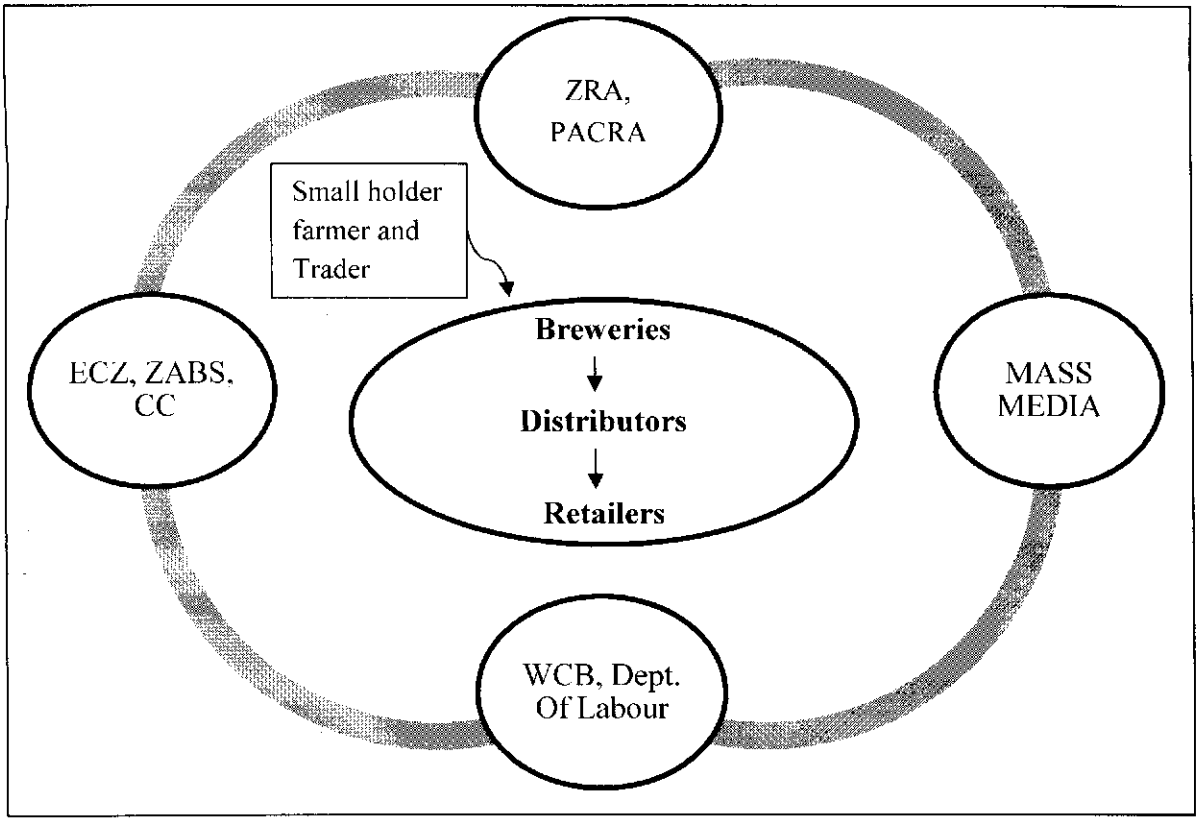
Figure 2 is a broad description of the sorghum opaque beer value chain in Zambia. The major actors of this chain are the three actors in the centre i.e. the breweries, distributors and the retailers. In a box joined by an arrow to the central part of the chain are the small holder farmers and the traders who play a minor role in the chain in Zambia but in other countries may have been part of the centre circle. Last but not the least is the circle surrounding the brewers, which is made up of bodies, both governmental and non-governmental, that provide information and standards for the industry to follow.

As earlier noted the smallholder sorghum farmers and traders play only a minor role as most the sorghum malt used in the brewing industry is imported. The breweries major role is to brew the opaque beer but it also performs other roles such as packaging, storage, delivery and they also set the prices at which the distributors and retailers sell their products. The distributors mainly provide transport and storage for the opaque beer, procuring it from the breweries and selling it to the retailers. Some breweries do not contract distributers to transport their beer but distribute it themselves. The retailers, after buying the beer from the brewery or distributors, sell it to the final consumer. Retail outlets are in the form of bars and taverns and provide feedback from the retailers to

distributors and brewers, bar facilities and entertainment such as showing soccer games and playing music.

The information and regulatory bodies can be grouped according to what type of regulations they set and administer. Zambia Revenue Authority (ZRA) and Patents and Companies Registration Agency (PACRA) provide information on taxation (Pay as you earn-PAYE, company taxes, excise duty, etc.) and registration, respectively. The Labour Department and Workers Compensation Board (WCB) provide rules and regulations related to workers rights and employment terms. The Environmental Council of Zambia (ECZ), Zambia Bureau of Standards (ZABS) and the City Council (CC) through the public health, engineering, fire and legal departments provide information and regulations related to ensuring that health and environmental standards are adhered to by the breweries and throughout its distribution and retail. Lastly, mass media organizations provide the industry with advertising opportunities and play a vital role in the provision of information.

Figure 2: Sorghum-Based Opaque Beer Value Chain in Zambia (May, 2012)



4.3 Characteristics of the Actors

4.3.1 Traders

The four traders in the sample were all found in Soweto market in Lusaka district. These were the only traders found to be selling sorghum after visiting various markets and asking the various stakeholders. In a year, they stock and sell about 500-700Kg of sorghum grain which they buy from small scale farmers at a price of K50, 000 per 50Kg bag and sell it at the price of K100, 000 per 50Kg bag. The sorghum grain bought and sold is a homogenous product and is therefore bought and sold at the same price. Their main customers usually buy the sorghum grain for use in households, for making porridge for babies and other food stuffs consumed in a home.

4.3.2 Breweries

There were a total of 11 breweries questioned in the study. Of the 11, 7 use sorghum in form of malt, in the production of their opaque beer while 4 did not use sorghum and maize roller meal is their major input. All the maize roller meal users produced unpackaged beer sold in 250L drums, while the sorghum malt users varied in packaging. Some of the sorghum-based opaque beer is sold unpackaged such as Nkwazi bulk and Special Chat while the rest is sold as packaged beer in crates which contain 15 cartons, each 1 Litre in size. Generally the term "bulk" is used to mean unpackaged beer.

A total of approximately 60,434,320 Litres of opaque beer is produced in a year (see Table 1) with Lusaka beer being the largest in quantity produced (43,800,000 Litres) amoungst the other opaque beers in the survey. Of the total litres of opaque beer produced, 55,102,320 Litres was sorghum-based opaque beer and 5,332,000 Litres was opaque beer without sorghum.

Table 1: Sorghum Use and Production by Brand in a Year (May, 2012)

No.	Brand	Sorghum Use	Quantity of Output per Year
1	Lusaka beer	Yes	43,800,000
2	Nkwazi beer & Nkwazi bulk	Yes	9,000,000
3	Kansaka beer	Yes	10,320
4	Special Chat	Yes	1,092,000
5	Chat beer	Yes	–
6	Waka beer	Yes	360,000
7	Pence beer	Yes	840,000
8	Luanshya beer	No	3,780,000
9	Kondwa beer	No	48,000
10	Mutomolo beer	No	504,000
11	Quality beer	No	1,000,000
Total			**60,434,320**

Users of roller meal all obtained their roller meal from milling companies within the province. Their major reasons for not using sorghum malt were lack of technology in form of a decanter and high costs of importing the malt from other countries such as South Africa. The decanter was needed to produce a smooth texture of opaque beer once sorghum malt is used in production. It was however noted, and supported by these brewers, that opaque beer made with sorghum malt produced better quality and tasting beer. Other ingredients used in the production of sorghum opaque beer were maize meal, yeast, enzymes and water.

The cost of the sorghum malt used in the industry did not vary much and ranged from K4500 to K5000 per kg. The products sold by each brewery are similar in content but they are differentiated by their brand names. The different breweries also procure their inputs from different places and as a consequence their output prices differ accordingly.

Sorghum malt used in the industry has been noted to come from three sources i.e. South Africa, Mozambique and Zambia. Midlands Breweries, Capital Breweries, Kansaka Breweries and the two Chat Breweries all get theirs from South Africa while Joma Breweries get theirs from Mozambique and Pence Brewery and General Dealers procure theirs from Zambia's Northern Province. From the companies surveyed, a total of 637.9 metric tons of sorghum malt in a year was seen to be imported from South Africa, 12.5

metric tons imported from Mozambique and 200 metric tons procured from Zambia. Figure 3: Sources of Sorghum, shows the percentage of breweries that get their malt according to the three countries mentioned.

Figure 3: Proportion of Companies that Procure their Sorghum from each Country in a Year (May, 2012)

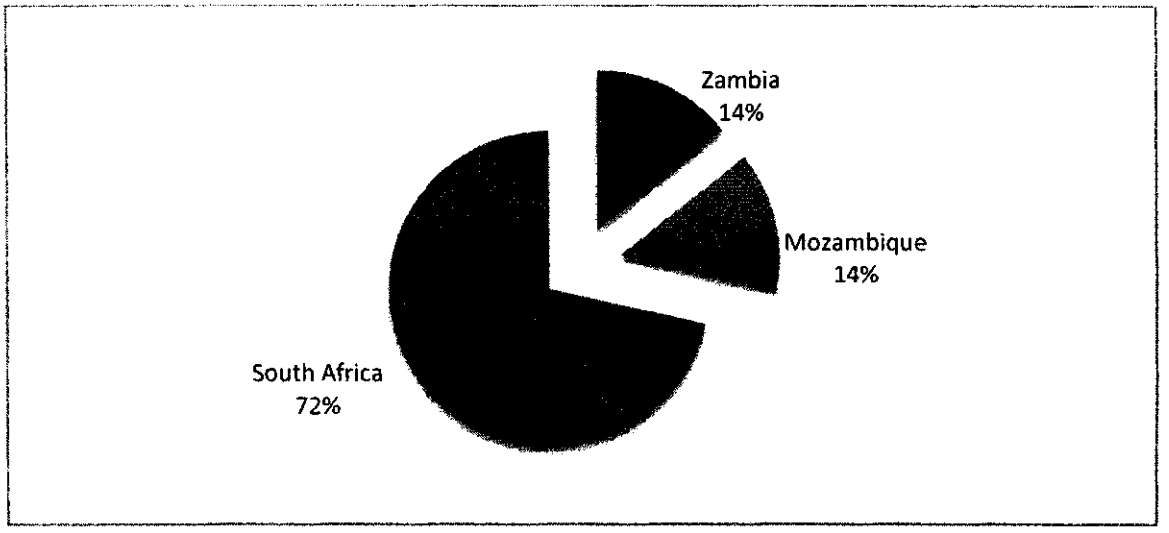
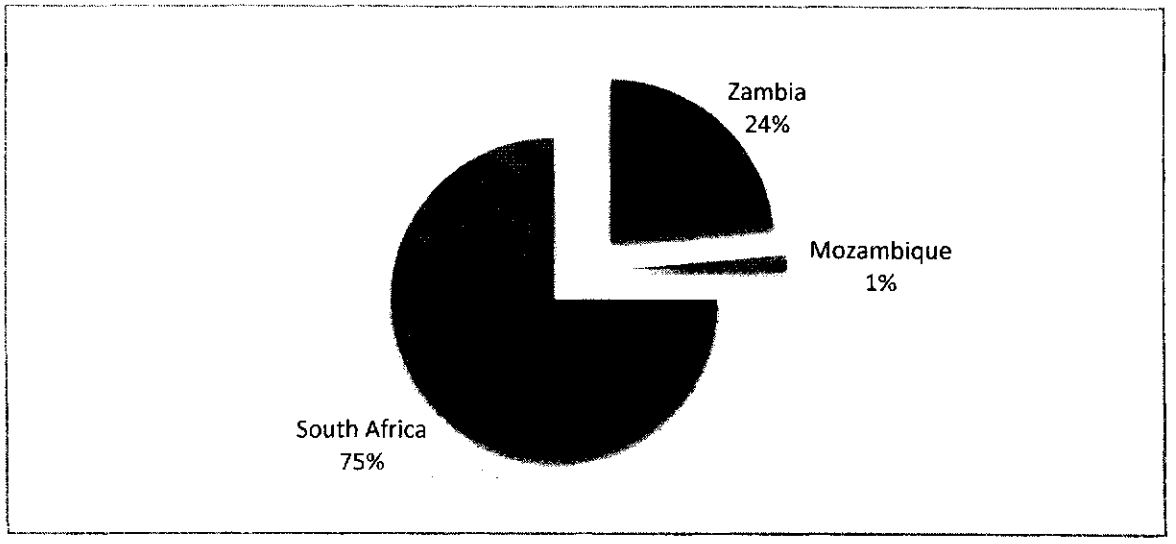


Figure 4 shows the proportion of sorghum used according to the country where it is procured. The majority of sorghum malt used is obtained from South Africa (75 percent), while much of the rest (24 percent) comes from within Zambia. Zambian malt is used only by one of the surveyed breweries (Pence Breweries and General Dealers). Mozambican sources contribute an insignificant one percent of the malt used. From the two figures (Figure 3 and 4) it can be seen that even though both Zambia and Mozambique have the same proportion of companies that procure sorghum malt from them (14 percent), a larger proportion of sorghum malt is used from Zambia as compared to from Mozambique.

Figure 4: Proportion of Sorghum Used in a Year by Companies per Source Country (May, 2012)

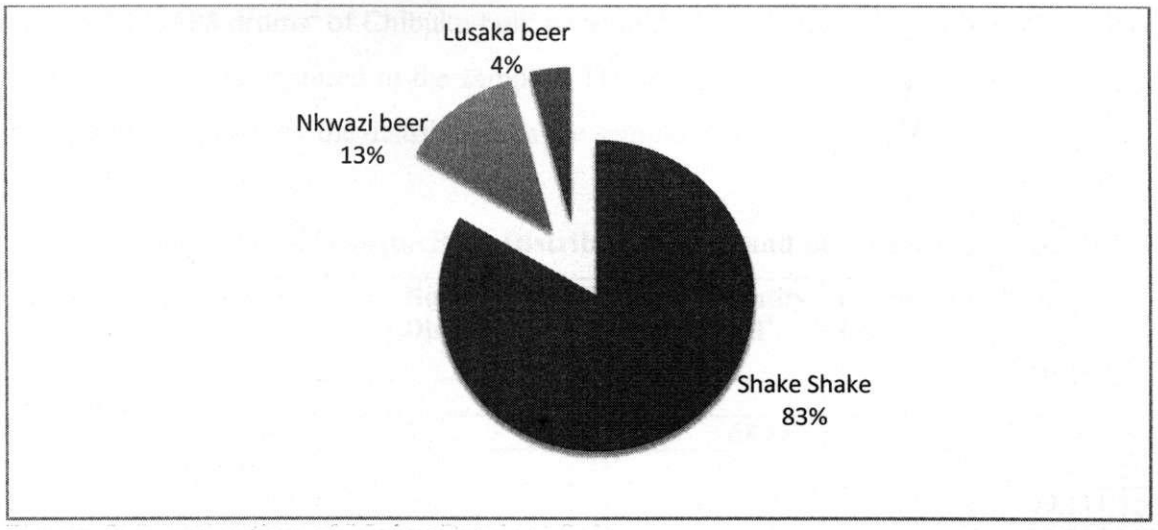


4.3.3 Distributors

There were a total of 25 distributors questioned in the research. Of the 25, 24 distributed packaged beer and only one distributed unpackaged beer (Chibuku bulk). From Figure 5, it can be seen that of the distributors contacted that the highest packaged beer distributed within the Lusaka district is Shake Shake manufactured by National Breweries (a brewery not questioned in the survey), followed respectively by Nkwazi beer and Lusaka beer. The other opaque beers do not appear to be distributed by any contractor and according to the information collected this was because being smaller breweries, they distributed their own beer.

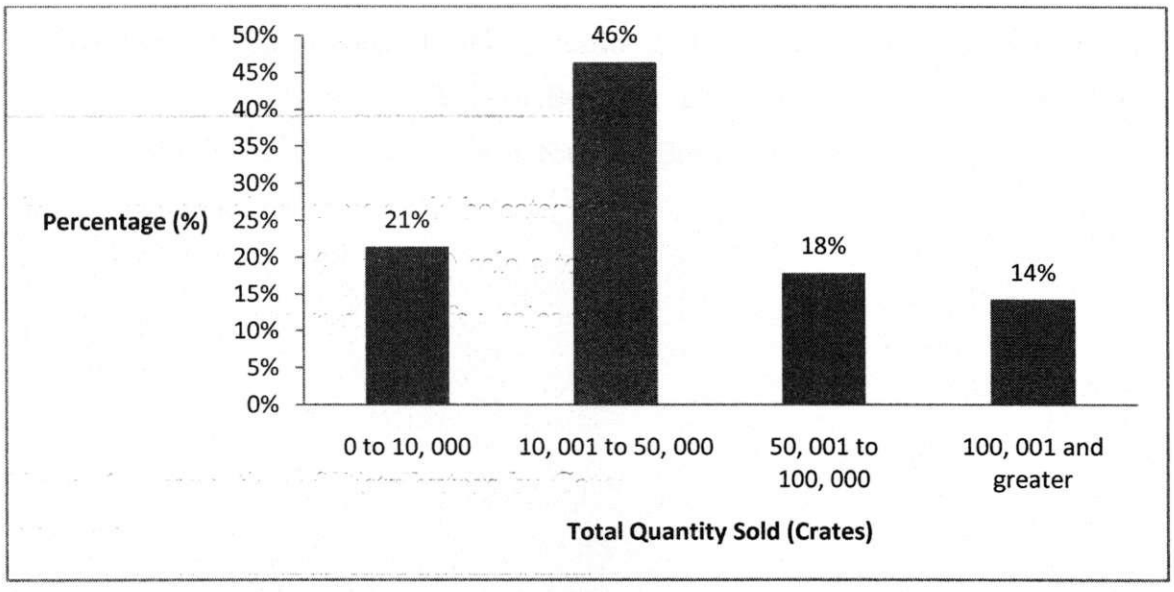
For unpackaged beer, it is seen again that the only opaque beer distributed by the firms questioned was Chibuku bulk manufactured by National Breweries. Other smaller breweries for unpackaged beer would also probably prefer to distribute their own beer and some do so in other provinces hence they may not have been captured by these results.

Figure 5: Distribution of Major Product Sold for Distributors in a Year (May, 2012)



The output of the distributors could be categorized as in Figure 6. From this it can be seen that most distributors' (46 percent) sale a total of 10, 001 to 50, 000 crates of sorghum based opaque beer in a year. Very few sales were made of above 100, 001 crates in a year (14 percent).

Figure 6: Proportion of Distributors by Categories of Total Quantity Sold in a Year (May, 2012)



A total of 1,490,368 crates[1] were sold in the previous year of packaged sorghum opaque beer and 11, 508 drums[2] of Chibuku bulk were sold (the only unpackaged beer distributed by the distributors captured in the sample). The total quantity of sorghum-based opaque beer thus distributed by the distributers in the sample is thus 25,232,520Litres.

Table 2: Quantities of Opaque Beer Distributed by Brand in a Year (May, 2012)

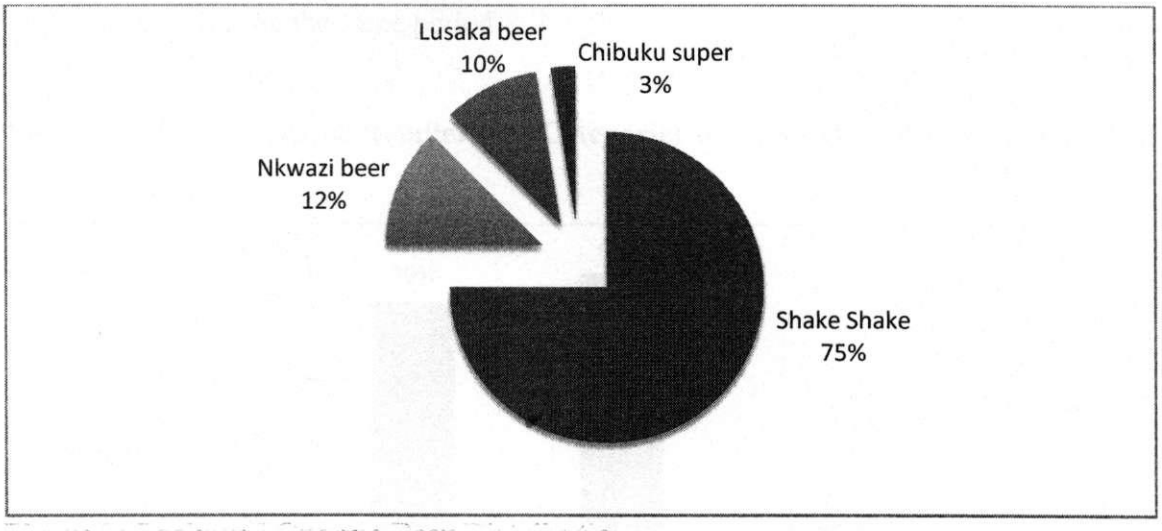
Brand No.	Brand	No. of Distributors	Total Quantity Distributed[3]	Conversion Factor	Total Quantity in Litres
Packaged					
1	Nkwazi beer	3	68,880	15	1,033,200
2	Lusaka beer	5	143,400	15	2,151,000
3	Shake Shake	20	1,278,088	15	19,171,320
Total			**1,490,368**	**15**	**22,355,520**
Unpackaged					
1	Chibuku bulk	1	11,508	250	2,877,000
Total		**1**	**11,508**	**250**	**2,877,000**
TOTAL		**29[4]**			**25,232,520**

4.3.4 Retailers

A total of 55 retailers were included in the study, of which 40 sold packaged beer while 15 sold unpackaged beer (Figure 7). The bulk of the packaged beer handled by the retailers was the Shake Shake brand by National Breweries (75 percent) followed by Nkwazi Beer (12 percent) and Lusaka Beer (11 percent). Chibuku Super (a bottled version of Shake Shake manufactured by National Breweries) was only sold by one of the retailers questioned (see Figure 7).

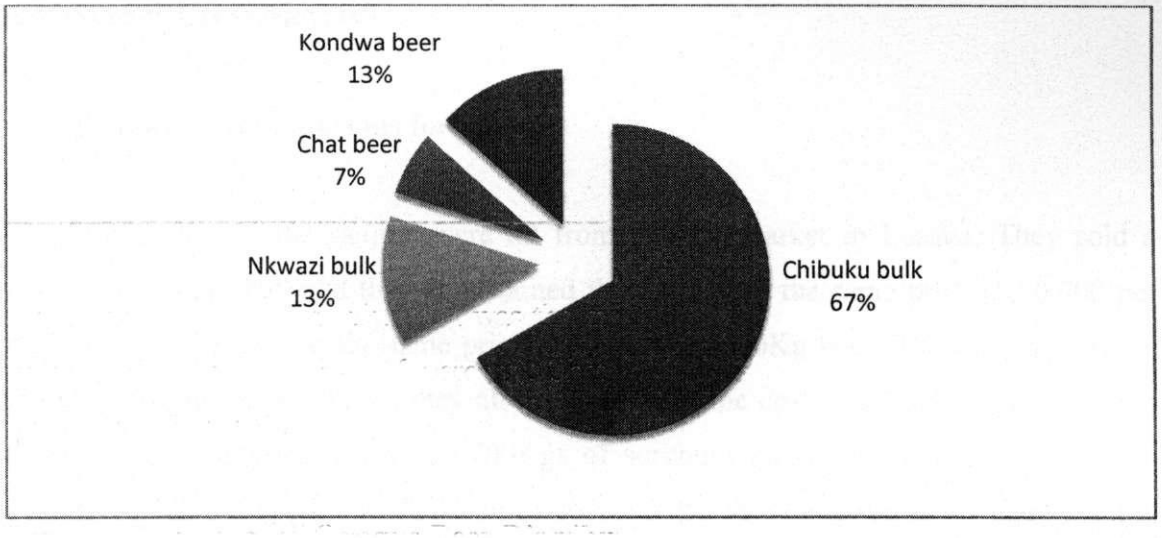
[1] 1 crate = 15Litres of opaque beer
[2] 1 drum = 250Litres of opaque beer
[3] Chibuku bulk is measured in drums while the rest of the beers are measured in crates
[4] A total of 29 distributors instead of 25 because some distributors distribute more than one type of beer

Figure 7: Packaged Opaque Beer Distribution in a Year (May, 2012)



For unpackaged beer Chibuku bulk was the most sold (67 percent) followed by Nkwazi bulk and Kondwa beer (both 13 percent). Chat beer was sold at a lesser degree of only 7 percent (see Figure 8).

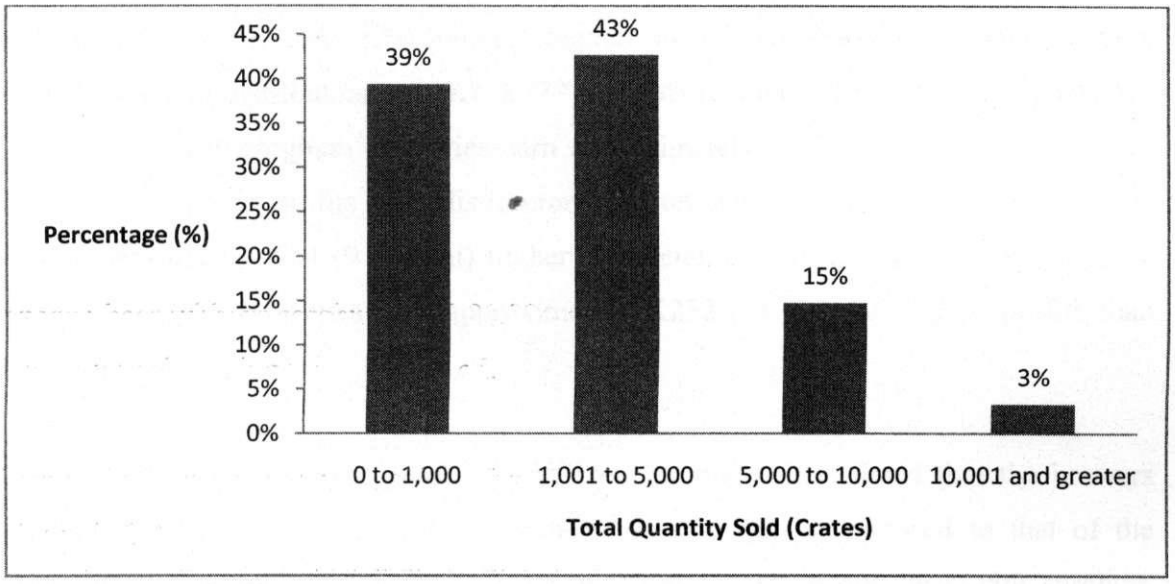
Figure 8: Unpackaged Opaque Beer Distribution in a Year (May, 2012)



Retailers can be categorized as shown in Figure 9. It can be seen from the table that the majority (82 percent) of retailers sell approximately 5, 000 crates or less each year and only a few (18 percent) sell more than 5,000 crates. A total of 380,228 crates of packaged beer were sold in the previous year, while 672 drums of Kondwa Beer (unpackaged

opaque beer without sorghum) and 81,884 drums of unpackaged sorghum-based opaque beer were sold during the same period.

Figure 9: Proportions of Retailers by Categories of Total Quantity Sold in a Year (May, 2012)



4.4 Average Gross Margins

4.4.1 Average Gross Margins for Traders

The four traders in the sample were all from Soweto market in Lusaka. They sold a homogeneous product and thus all obtained the product at the same price (K50,000 per 50Kg bag) and sold it at the same price (K100,000 per 50Kg bag). The traders were all found at Soweto market hence they all incurred the same cost of storage of K22,500 per month. With a total of about 500-700Kgs of sorghum grain sold in a year giving an average of 50Kg sold per month, it can be deduced that the storage costs are equivalent to that needed for a 50kg bag. Therefore, the average margin for each trader is calculated to be K22,700 per 50Kg of output sold.

4.4.2 Average Gross Margins for Breweries, Distributors and Retailers

Table 3 depicts the average gross margins for each chain actor according to the type of beer produced. It indicates that for packaged beer breweries earn approximately K1,807 (87 percent) and K1,643 (79 percent) higher profits than distributors and retailers respectively and distributors earn K138 (37 percent) less than retailers. For unpackaged opaque beer with sorghum breweries earn approximately K120 (32 percent) and K143 (39 percent) higher profits than distributors and retailers respectively and distributors earn approximately K24 (9 percent) higher than retailers. For unpackaged opaque beer without sorghum breweries earn approximately K252 (51 percent) higher profits than retailers.

Comparing the chain actors producing different products, it is noted that the brewers producing packaged beer earned the highest gross margin as opposed to that of the unpackaged beer with and without sorghum. Unpackaged opaque beer with sorghum portrayed the highest costs in terms of other input costs and thus has a lower margin as compared to unpackaged beer without sorghum. For distributors, no margin was calculated for opaque beer without sorghum because no distributor questioned distributed them. As earlier noted this could be because they proffered to distribute the opaque beer themselves. From the data collected, distributors of packaged beer had an average margin of K261 which was higher (by K9) than that of distributors of unpackaged beer of K252. In the case of retailers, retailers of packaged beer had an average gross margin of K425 per Litre of opaque beer distributed while that of unpackaged opaque beer with sorghum was K252 per Litre and without sorghum K240 per Litre. A higher margin is noted for the packaged opaque beer than unpackaged opaque beer and unpackaged opaque beer with sorghum fetched higher gross margins than without sorghum (see Table 3).

Table 3: Average Gross Margins for Opaque Beer Value Chain Actors by Product in K/Litre of Output (May, 2012)

Product	Chain Actor	No. of Actors	Av. Price per Litre sold	Costs		Av. Gross margin
				Av. Cost of *Major Input*	Av. Cost of *Other Inputs*	
Packaged Beer						
	Brewer	2	2250.0	4.7	177.5	**2067.8**
	Distributor	30	1916.9	1655.9	0.0	**261.1**
	Retailer	62	2487.0	2062.4	0.0	**424.6**
Unpackaged Beer						
With Sorghum	Brewer	2	620.0	7.0	241.5	**371.5**
	Distributor	1	872.0	620.0	0.0	**252.0**
	Retailer	14	856.9	628.4	0.0	**228.4**
Without Sorghum	Brewer	2	600.0	91.6	16.6	**491.8**
	Retailer	2	840.0	600.0	0.0	**240.0**

4.5 Linkages

In the sorghum-based opaque beer value chain, the four chain actors interviewed i.e. the traders, brewers, distributors and retailers, revealed that they had buyer, seller and competitor relationships amoungst themselves. Buyer-seller relationships existed along the chain as value was added from one category of chain actor to the next. And competitor relationships existed within each category of chain actor e.g. retailers versus retailers. For the chain actors as a whole the governmental institutions were seen as a policy maker and hence provided guidelines on how the chain would operate. Detailed below are the strengths or weaknesses of these linkages and/or relationships according to the chain actor categories.

4.5.1 Traders' Linkages

Traders when questioned revealed that they have strong linkages with farmers, fellow traders and commodity brokers but a weak relationship with breweries and a neutral relationship with government institutions (see Table 4).

Table 4: Strength of Linkage Table for Retailers (May, 2012)

Strength of Linkage					
Type of Chain Actor	**Strong**		**Weak**		**Total**
	Freq.	%	Freq.	%	
Farmers	4	100	0	0	4
Small scale traders	4	100	0	0	4
Commodity brokers	4	100	0	0	4
Breweries	0	0	3	100	3
Government institutions	2	50	2	50	4

4.5.2 Breweries' Linkages

The one brewery with a relationship with the farmers said they had a strong relationship with them. As a whole the breweries were seen to have strong relationships with distributors (100 percent), retailers (100 percent) and government institutions (73 percent). They however, had weak relationships with their fellow breweries (73 percent). They did not mention having any relationships with small scale traders and sorghum commodity brokers.

Table 5: Strength of Linkage Table for Breweries (May, 2012)

Strength of Linkage					
Type of Chain Actor	**Strong**		**Weak**		**Total**
	Freq.	**%**	**Freq.**	**%**	**Freq.**
Farmers	1	100	0	0	1
Breweries	3	27.27	8	72.73	11
Distributors	4	100	0	0	4
Retailers	11	100	0	0	11
Government institutions	8	72.73	3	27.27	11

4.5.3 Distributers Linkages

The distributors had a strong relationship with breweries (88 percent), retailers (72 percent), their fellow distributors (72 percent) and a split in strength of relationship with government institutions. They did not mention having any relationships with farmers, small scale traders and sorghum commodity brokers.

Table 6: Strength of Linkage for Distributors (May, 2012)

Strength of Linkage					
Type of Chain Actor	**Strong**		**Weak**		**Total**
	Freq.	**%**	**Freq.**	**%**	**Freq.**
Breweries	22	88	3	12	25
Distributors	18	72	7	28	25
Retailers	25	100	0	0	25
Government institutions	12	48	13	52	25

4.5.4 Retailers' Linkages

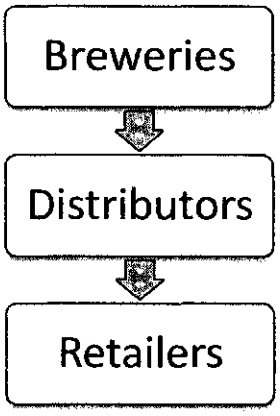
The retailers had strong links with breweries (63 percent), distributors (89 percent), and a weak links with governmental institutions (67 percent) (see Table 7). They however, had strong links with their fellow retailers (87 percent).

Table 7: Strength of Linkage for Retailers (May, 2012)

Strength of Linkage					
Type of Chain Actor	**Strong**		**Weak**		**Total**
	Freq.	**%**	**Freq.**	**%**	**Freq.**
Breweries	35	63.64	20	36.36	55
Distributors	40	88.89	5	11.11	45
Retailers	47	87.04	7	12.96	54
Government Institutions	18	32.73	37	67.27	55

In summary, the vertical linkages are as indicated in Figure 10, where the arrows signify the flow in the chain and both players in each relationship indicated that they had a strong relationship with each other. For horizontal linkages; traders showed a strong relationship (100 percent); breweries weak (73 percent); distributors strong (72 percent) and; retailers strong (87 percent).

Figure 10: Vertical Linkages of the Main Players in the Industry (May, 2012)



4.6 Rules and Regulations

Breweries: Rules and regulations from breweries to suppliers included that suppliers meet product specifications for raw material, give credit facilities for their products, monitor pricing, discuss payment terms with them before sale, inform them in case of a breakdown and provide the raw materials which should be kept at a certain standard and packaged in a certain way.

Rules and regulations to buyers from the breweries included the requirements that they should have adequate water on the premises, keep the surroundings and the toilets clean and wash drums nicely before new beer is put in. Once the beer is bought, the buyers are not to add water or mix the product with other products and should be able to keep the beer in a cool place so that it does not ferment fast. The buyers are also required to have local licences to sell the beer and always protect the environment by not discarding the product carelessly. If they have any problem the breweries invite their buyers to report them promptly.

Distributors: The Breweries, the sellers to the distributors, ask them to comply with certain rules and regulations as found when questioning the distributors. The first is that they should not use crates for one product (e.g. Shake Shake) to pack other competing products (e.g. Nkwazi beer). They should be able to keep the surroundings where the product is to be sold clean and water should be readily available. They are also asked not to drink beer at the supplier's premises and alter prices of the product and so sell the product as the brewery dictates.

The distributors in turn also request that the breweries attend to queries as fast as possible and in doing so respect their opinions and suggestions. When ordering the product, the distributors also ask that the brewers use only crates labelled with the breweries name. The distributors require that their buyers, mainly the retailers, to come with their own empty crates when coming to buy the beer and those under the age of 18 are not allowed on the premises. The buyers should check the product before leaving the premises to assess its quality and see if there are any damages. The buyers should also make sure the surroundings are to be kept clean.

Retailers: The distributors require their buyers, the retailers, follow some guidelines as they trade with them. One of them noted by the retailers is not to sell the opaque beer to persons under the age of 18. They are also required to sell the products only at the price dictated by the breweries and thoroughly clean the drums used before putting in the beer. The retailers on the other hand require that they should be able to allow them to check the product to ensure that it's of acceptable quality and accept to take back the product if has expired. They should also be able to keep the premises clean. The retailers require that their customers are to behave well in the premises and are able to verify that they are or are above the legal age of drinking i.e. 18 years of age.

In summary the rules and regulations mentioned above have pros and cons. On the positive side, the rules and regulations from brewers to their buyers were mainly to ensure good quality of the product such as adequate water, keeping the surroundings clean, prohibition of mixing the product with other substances etc. The distributors also

try to ensure a good quality of beer produced through checking the product before leaving the premises, keeping surroundings clean, ensuring crates are well labelled with brand names of the beers etc. And the retailers play a major role in controlling underage drinking by enforcing a rule that those under legal drinking age (18 years) are not allowed to partake of the opaque beer sold on their premises. On the negative side, the determination of price by the breweries at which their products are sold for both the distributors and the retailers could be a hindrance to the distributors, retailers and the chain as a whole. The distributors and retailers may incur costs unforeseen by the breweries and hence reduce their profit margins.

4.7 Challenges Faced

From Table 8, it can be seen that financial factors were the most common of the challenges faced by all the chain actors as it had the highest frequency of complaints in each category of chain actor. For the breweries, exogenous challenges were just as high as financial challenges. Problems concerning the product (opaque beer) were also faced by all the chain actors with an exception of the traders. Concerns about the inputs such as supply and pricing were put forward by the breweries and retailers as some of the challenges they also faced. Management challenges had the least complaints.

Table 8: Categories of Challenges Faced by each Chain Actor (May, 2012)

	Categories of Challenges Faced*					
Chain Actor	**1.Product**	**2. Financial**	**3. Exogenous**	**4. Inputs**	**5.Management**	**Total**
Trader	0	6	2	0	0	**8**
Brewer	3	11	11	7	1	**33**
Distributor	3	1	4	0	0	**8**
Retailer	4	7	0	2	2	**15**

*Key:

1. Product- Poor packaging, Product going bad (perishable product)
2. Financial- High taxes and fees, Limited access to credit, Losses due to fixed prices, Fluctuation in sales

3. Exogenous-Limited market space, Weather, Political interference, Electricity supply shortages, Poor information flow in the chain, Competition, Challenges, Breweries refusal to take back damages
4. Inputs- Inadequate supply of inputs, Utility of inputs expensive, High prices of inputs or raw materials, Limited access to machinery and equipment
5. Management- lack of control of sales men, customer misbehavior, prevalence of pests

Specifically, the challenges faced by the categories of chain actors differed.

Traders: The most common challenges faced by the traders were that of financial factors (see Table 11). The most prevalent of the financial challenges faced was that of limited access to credit followed by complaints of fluctuating sales which were caused by instances where there would be very few customers to buy the sorghum grain and losses due to fixed prices. Other challenges faced were exogenous factors in the form of poor information flow in the chain and limited market space.

Brewers: The financial challenges most faced by the brewers were that of high taxes and fees followed by limited access to credit and to machinery and equipment. The exogenous challenges experienced by the breweries included poor information flow, weather inconsistencies, political interference, electricity supply shortages and competition which were seen as a challenge because some competitors were said to be unregistered and hence faced no taxes giving them an unfair advantage of reduced costs. Input challenges included those of inadequate supply of inputs, high costs incurred in the purchase and utility of inputs or raw materials and limited access to machinery and equipment. Challenges faced by the breweries concerning the product mainly consisted of perishability and packaging issues. And the management challenge experienced pertained to control of sales men. The challenges which were only faced by one or two brewers should not be belittled but taken as pertinent issues to be addressed.

Distributors: The distributors' major challenge faced was that of exogenous factors and in this category it was mainly the issue of information flow with a single complaint of breweries' refusal to take back damaged products discovered after the product left the premises of the brewery. Other challenges faced included fluctuation in sales and

perishability of the product which fall into the financial and product categories respectively.

Retailers: The major challenges faced by the retailers were financially related. Of these the highest complaint was that of fluctuating sale but limited access to credit, high taxes and fees and losses due to fixed prices were also experienced. Problems to do with the product i.e. poor packaging and perishability of the product were also an issue faced. Another challenge noted for the retailers was high costing inputs and/or raw materials. The rest of the challenges faced were management related such as customer's behaviour and prevalence of pests.

4.8 Improving the Industry

This sub-section deals with possible ways in which the different actors thought it would be best to improve not only their individual companies, but the value chain as a whole. The suggestions which came forth from the project research are mentioned below according to the categories of chain actors.

4.8.2 Suggestions by the Chain Actors

Suggestions from the Traders: To improve their businesses, the traders suggest that all sorghum traders should be able to sell within the designated area (in the market stalls) because they had noticed that some other traders tended to trade from outside the stalls and this caused unfair competition.

Suggestions from the Breweries: In order to increase output and efficiency of the brewing firms the following categories were identified which needed improvement by the breweries.

Personnel: Employing qualified personnel, encouraging in-house training for various to departments reduce, having trusted and hardworking salesmen and overall management of the company is needed to improve the operations and reduce certain costs.

Product: Purchasing adequate raw materials (e.g. sorghum) that should be provided in a timely manner, consistency in quality. Improving the products' shelf life and sanitary conditions around the brewing factory would all improve the quality of the beer produced. Beer being a perishable product also needs efficient provision of electricity. Investing in packaging for the product and labelling would be helpful to the industry and would allow bodies like ZRA to collect taxes and level the competition.

Transportation: Breweries could procure more company cars to transport the beer as it is costly to hire trucks as a way to improve transportation, distribution or delivery of the product and enhance consistency in the supply so as to satisfy consumers.

Finance: In order to make improvements to these areas a vital category to look at is finance either in form of accessing more equity capital or credit to address the above concerns. Also in this area, some breweries suggest help may be given by government by reduction of taxes and closing some breweries that do not comply with standards set so as to reduce competition from these low cost breweries.

Suggestions from the Distributors: In order to improve the distribution of the product and efficiency in the value chain, the distributors suggest that the government should always include them in policy making decisions. Other suggestions for improvements are categorized below according who the distributors think should address the issue.

Breweries: Suggestions to the breweries include having competitions more often to encourage the sale of the product and reducing order prices. It is also requested that breweries create a smaller pack that will be cheaper to accommodate those who can't afford a bigger pack and have better crates so that the beer does not get damaged during

transportation. To the breweries that deliver the product to the premises of the distributor the product should be delivered promptly.

Distributors: To improve distribution, losses could be avoided by distributing the product on time in order to avoid expiry of the opaque beer. The distributors in trying to address the issue of sales suggest improving the information flow and looking for additional buyers as a solution. The distributors should also always check the under-weights while still at the breweries to reduce the number of under-weights and hence losses. Under-weights are the packages that weigh less than they should (i.e. 1Litre) maybe due to spillages or improper filling of the packages.

Suggestions from the Retailers: The following are the improvements suggested by the retailers to improve sales and the value chain as a whole.

Costs and Prices: The cost (or order price) of a drum of beer should be reduced so that more profit can be realized. The retailers also advocate for an increase the price of the beer as a retailer to make profit.

Retailers: The retailers should be able to attract more customers to make increased sales. More fridges could also be bought so that the beer can be cooled to reduce fermentation. They could also be prudent and try to as much as possible re-invest most of the profits into the business in order to be able to expand the business size and accommodate more customers. Handling customers in appropriate way should be a priority as well. The bar could remain open for as long as the customers are there Addressing the issue of pests (e.g. rats) destroying packages.

Breweries and Distributors: Breweries should improve packaging, which should include expiry/manufacturing dates, and be able to reduce spillages. They should improve delivery services of the product and shortages in supply and provide better storage facilities. Monthly promotions by breweries to attract retailers should be encouraged as

well as help to improve appearance of the bars e.g. painting and other renovation works on the bars and taverns.

CHAPTER FIVE

CONCLUSION AND RECCOMMENDATIONS

5.1 Conclusion

The chain actors involved in production of opaque beer were seen to be small scale farmers, traders, breweries, distributors, retailers and the information and regulatory bodies i.e. ZRA, PACRA, WCB, ZABS, ECZ, CC, Labour Department etc. Their functions were defined by the activities they performed to add value to the product. Mainly small scale farmers and traders were involved in supplying sorghum malt; breweries were involved in manufacturing the product, storage, determining price and in some cases distribution; distributors took up the role of transportation of the opaque beer from the breweries to the retailers and sometimes provided storage facilities and; the retailers in their outlets in form of bars and taverns sold the beer to the end consumers and also provided sources of entertainment through music and programmes televised on television sets.

Value added in the chain could firstly be seen through the various activities that each player performed at each stage of value addition. In the analysis however, a second method of providing estimates at value added at each stage through profit margins was also used. It was seen that for the different types of opaque beer, breweries had the highest margins. They exhibited the highest gross margin for the different types of opaque beer with the packaged sorghum opaque beer-87 percent higher than distributors and 79 percent higher than retailers. For packaged beer distributors had a 32 percent lower profit margin than retailers. For unpackaged sorghum opaque beer brewers had a profit margin of 39 percent higher than retailers while for unpackaged opaque beer without sorghum it had a 51 percent profit margin higher than retailers.

Looking at the proportion of Sorghum malt used in the industry and where it was obtained, the three sources of sorghum malt were South Africa providing 637.9 tons to 5 breweries; Mozambique providing 12.5 tons to 1 brewery and; the small scale farmers

from Zambia's Northern Province providing 200 tons to one brewery all within a period of a year. Regarding production, the breweries were seen to produce an approximate of 60,434,320 Litres of opaque beer in a year, of which 55,102,320 litres was sorghum opaque beer and 5,332,000 was opaque beer without sorghum.

Linkages in the chain between the breweries and distributors and the retailers and vice-versa were determined to be strong. Horizontal linkages within each category of traders, distributors and retailers were also strong with the exception of the breweries that had weak horizontal links. Because only one brewery obtained its sorghum malt from within Zambia one can conclude that the links with local small holder sorghum farmers and traders is poor.

Most of the rules and regulations in the industry boarded around hygiene and setting of prices by breweries which are followed by distributors and retailers. The major challenges faced by almost all actors of the chain, if not all, that should be addressed include poor information flow in the chain, delays in distribution, short shelf life of the product and limited access to credit. With these addressed a more efficient and productive industry could be achieved.

The two major opportunities that were noted include that of the sorghum opaque beer being of better quality than opaque beer without sorghum and the possibility of growth in the industry especially if cost of production could be reduced by procuring sorghum malt from within the country.

5.2 Recommendations

Given the results obtained from the research, I would recommend that a commodity broker like CHC should be to be established to specifically channel sorghum, or if possible already malted sorghum, to opaque beer production. This would be helpful in reducing costs of importing malt and increase profits to the industry. In line with this

prompt delivery channels should be established in order to achieve efficiency in the chain.

Through the profit margins the differences were noticed though the causes for these differences were not researched in this project and hence cannot be attributed only to the value added. More research could be pursued to identify the causes of differences in the margin with particular emphasis on finding out differences in cost structures of breweries using domestically produced sorghum malt as opposed to imported sorghum malt.

Lastly, concerning the linkages, a positive for the value chain is that both vertical and horizontal linkages were strong with the exception of the horizontal linkages amoungst the breweries. This should be improved through perhaps forming forums that would allow competing breweries to meet and exchange of information and ideas that would improve the overall productivity of the chain. In this case some firms brewing beer without sorghum could put resources together to procure technology that might otherwise have not been possible individually e.g. a decanter. This would encourage adoption of sorghum by those breweries that are unable to use sorghum due to lack of technology. The improvement of linkages could further improve quality assurance, which is of key importance in the industry (as noted through various hygiene and sanitary rules and regulations) and boost the industry.

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APPENDICES

Appendix 1: Questionnaire

Questionnaire Serial Number: ☐☐☐

SORGHUM OPAQUE BEER VALUE CHAIN IN ZAMBIA

1. Company identification

1.1 Province _____ **prov** ☐☐

1.2 District _____ **dist** ☐☐☐

1.3 Company name _____ **comp** ☐

1.4 Major Service provided **srvce** ☐
1= Trader 2= Brewer 3= Distributor 4= Retailer 5= Other .....

1.5 Address of the company _____

Email address _____ **Telephone number** _____

1.6 Name of main respondent _____

1.7 Designation of main respondent **rdes** ☐
1 = Proprietor 2 = Manager
3 = Other (Specify)_____

1.8 What is your core business? _____

1.9 Name of enumerator _____ ☐ **Date** ☐☐☐☐☐☐

2. Inbound logistics

I am going to ask you about the procurement of your inputs and their warehousing activities

IL01. What is the major (sorghum) input you use? _____

IL02. How much does your major (sorghum) input cost per unit? _____

In what form do you.....		What attributes do you look for in your major input?	Total quantity of the commodity handled		Most important supplier of input	In which province is the supplier located	How do you get most of the supplies	What is the distance from your suppliers (in km)	Transportation costs for the qty purchased (Kwacha)	How much of the commodity did you use?	Stocks held per month		Storage costs/month/unit (Kwacha)
Buy your input	Use your input		Qty	Unit Codes below	Codes below		Codes below				Qty	Unit Codes below	
IL03	IL04	IL05	IL06	IL07	IL08	IL09	IL10	IL11	IL12	IL13	IL14	IL15	IL16

IL05 codes	IL08 codes		Province codes (IL09)		IL10 codes	Unit codes(IL07, IL15)
1= Grain size 2= Grain shape 3= Colour 4= Other, Specify..... 5=Other, Specify.....	1= Commercial farmers 2= Smallholder farmers 3= Wholesalers 4= Retailers 6= CHC holdings 7= Small scale traders	8=Central Breweries 9= National Breweries 10= Kankoyo Breweries 11= Other, specify	1=Central 2=Copperbelt 3=Eastern 4=Luapula	5=Lusaka 6=Northern 7=N/western 8=Southern 9=Western 10= Muchinga 11= Other (Specify)	1= Delivered to company 2= Sellers premises 3= Market place in Lusaka 4=Market place in supplier's province 5= Other (Specify).....	1=Metric tons 2=Kg 3=Crates 4=Litres 5= Other (Specify) .....

3.2 Substitutes

What inputs do you use as substitutes for sorghum in the production of your main product		Rank the substitutes as preferred (1,2,3,4....n; Where 1= most preferred and n= least preferred)	How often do you substitute it for sorghum (1= Often 2= Rarely)
SB01	0 =No, 1 =Yes	SB02	SBO3
1= Maize			
2= Millet			
3= Other, specify			
4= Other, specify			

3.3 Why is the top ranked in the previous table most preferred?

_____

_____

(NOTE: *QUESTIONS 3.4 AND 3.5 ARE FOR TRADERS, DISTRI BUTERS AND RETAILERS ONLY*)

3.4 Do you perform any activities that add value to the input you receive?

0= No →go to section 4

1= Yes OP01 ☐

3.5 What activities do you perform?

Activity	0 = No and 1 = Yes
1.Grading the product	
2. Packaging/ Repackaging	
3. Collection of input from sources	
4. Transportation/ Delivery	
5. Storage	
6. Drinking/Bar facilities (i.e. a place where drinking can take place)	
7. Entertainment facilities (i.e. music, TV, live performances, etc.	
8. Other (specify).....	

4. Outbound logistics

I am going to ask you about the sale of your main product

4.1 What is the major output of your business? _____

Name of product	How much product did you sell in the past 12 months?		Storage costs for the quantity you had to sell? (ZMK)	Main buyer of product	In which province is the main buyer located?	Delivery location	Delivery charges (ZMK)	What is the price per unit of output sold?	
	Quantity	Unit Codes below		Codes below	Codes below	Codes below		Price	Unit Codes below
Prod	OL01	OL02	OL03	OL04	OL05	OL06	OL07	OL08	OL09

OL02 and OL09 codes	OL04 codes	OL05 codes		OL06 codes
1= tons	1= consumers, direct sales through own outlet	1=Central	5=Lusaka	1= own premises
2= kgs	2= distributers	2=Copperbelt	6=Northern	2= buyers premises
3= liters	3= wholesalers	3=Eastern	7=N/western	3= storage shed
4= cartons	4= retailers	4=Luapula	8=Southern	4= market place in Lusaka
4= other (specify).....	5= other (specify)		9=Western	5= market place in buyers province
	.....		10=Muchinga	6= other specify.....

5. Marketing

5.1 Do you offer any marketing services?

0= no →go to Question 5.3

1= yes MK01 ☐

5.2 Marketing activities and their respective costs

	What activities do you perform to market your product?	Total cost of .....(activity) in the past 12 months
	MK02	MK03
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

5.3 How do you determine the price per unit of your output?

1= Use prevailing market price

2= Inscribed in government regulation

3= Cost plus fixed profit margin

4= Percentage of cost

5= Other, specify..... MK04 ☐

6. Service activities

6.1 Do you offer any after-sales services?

0= no →go to section 6.3

1= yes AS01 ☐

6.2 What after-sales services do you perform?

Service	0= No, 1=Yes
1= provision of support equipment	
2= delivery	
3= complaints handling	
4= training	
5= other, specify.....	
6= other, specify.....	
7= other, specify.....	
8= other, specify.....	

6.3 Do you outsource any services?

0= no → go to section 7.

1= yes OS01 ☐

6.4 What services do you outsource?

Service	Do you outsource this service? 0= no → go to service 1= yes	Total cost of .... in the past 12 months
Serv	OS02	OS03
1= Transportation of inputs		
2= Transportation of outputs		
3= Advertising		
4= Auditing		
5= Human resource management		
6= Other, specify		
7= Other, specify		

7. Information flow

I will ask you some questions on how you obtain different types of information.

7.1 What is the major source of information?

Type of information	Source of ..... information Codes below
Info	**IF01**
1= Input Price	
2= Output Price	
3= Input Quality	
4= Output Quality	
5= Input Quantity	
6= Output Quantity	
7= Customer preference	
8= Input market	
9= Product market	
10= Rules and regulations	
11= Other (specify).....	
12= Other (specify).....	

IF01 Codes
1= Survey
2= Other brewing firms
3= Zambia Bureau of Standards
4= Mass media
5= Other Government Departments
6= NGOs
7= Distributors and Retailers
8= Other (specify)

8. Rules and regulations

I am going to ask you about the rules and regulations that govern your industry.

8.1 Give two rules or regulations that ask you your suppliers to comply with.

SR01:_____

_____

_____

SR02:_____

_____

_____

8.2 Give two rules or regulations that your buyers ask you to comply with.

BR01:_____

_____

_____

BR02:_____

_____

_____

8.3 Implementation and consequences of rules and regulations

Rules and Regulations Codes below		
Rules or regulation	Advantages of the rule	Disadvantages of the rule
RR01	**RR02**	**RR03**

RR01	**RR02**	**RR03**
1=SR01 2=SR02 3=BR01 4=BR02	1= Guaranteed quality 2= Guaranteed quantity 3= Efficiency in the chain 4= Reduced costs 5= Ease to determine price 6= Other specify……	1= Costly to implement 2= Time consuming 3= Difficult to implement 4= Other specify

9. Policies and Challenges

9.1 Do you know of any policies that affect marketing and utilization of sorghum and its products?

0= no→ go to 9.3.2

1= yes PL01 [ ]

9.2 Give three polices that are in place in the industry

P01:_____

_____

_____

P02:_____

_____

_____

P03:_____

_____

_____

9.3 Policies and challenges faced by the industry

9.3.1 Policies Codes below			9.3.2 What challenges do you face?	
Policy	Advantages	Disadvantages		
PC01	PC02	PC03	Chal	0= No 1= Yes
			1= Limited access to credit	
			2= Poor organization of the production and marketing systems	
			3= High taxes and fees	
			4= Poor information flow in the chain	
			5= Limited access to machinery and equipment	
			6= other, specify	
			7= Other, specify	

PC01 codes	PC02 codes	PC03 codes
1= P01 2= P02 3= P03	1= Guaranteed quality 2= Guaranteed quantity 3= Efficiency in the chain 4= Reduced costs 5= Ease to determine price 6= Other specify.....	1= Limits growth in the industry 2= Increases cost of inputs 3= Hinders access to machinery and equipment 4= Other specify

9.4 What do you think should be done to improve the performance of your company?

10. Linkages

10.1 What type of relationship do you have with the other stakeholders in the chain?

Type of chain actor	Type of relationship	Strength of relationship
LN01	**LN02**	**LN03**
1= Farmers		
2= Small scale traders		
3= Commodity brokers		
4= Breweries		
5= Distributors		
6= Wholesalers		
7= Retailers		
8= Government institutions		
9= Non-governmental institutions		

LN02 codes		LN03 codes	
0= none	3= competitor	0= none	3= weak
1= buyer	4= policy maker	1= very strong	4= very weak
2= seller	5= other, specify	2= strong	