ASSESSMENT OF THE ROLE OF INSTITUTIONS AND TRANSACTION COST IN SORGHUM SUPPLY CHAIN IN SINGIDA RURAL DISTRICT

BY

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ABSTRACT

The study assess the role of institutions and transaction cost in sorghum supply chain in Singida Rural District. Data were collected from secondary and primary sources. A sample of 60 sorghum farmers, 9 traders, 9 institutions supporting sorghum production and marketing was interviewed. The data obtained were used to describe the structural and social-economic factors that influenced farmers in production and marketing along the supply chain, examine type and role of institutions supporting sorghum production and marketing and transaction cost incurred by actors along the chain. Data was analyzed by descriptive statistics, marketing margin and correlation analysis. Marketing margin and correlation analysis were estimated as indicators of market efficiency. Three sorghum marketing channels were identified (i) farmer's selling direct to local consumers (ii) farmer's selling to village trader's who in turn sell to local consumer and (iii) farmer's selling through village traders, urban trader's, urban wholesaler's and retailer's to urban consumers. The study revealed that, the flow of sorghum from producers to consumers leads to long supply chain which leads to high transaction cost. High market margin was realized at wholesale level compared to the other chain actors. There was a negative correlation between buying prices and market margin which results to unstable market. This reflects less income to sorghum producers and more benefit to other chain actors. Major constraints to sorghum production and marketing were unreliable market, low producer prices, pests including birds like quelea quelea and limited access to market information. The study recommends that, market information should be improved by promoting telecommunications infrastructure in the area. Institutional supporting sorghum should link sorghum farmers to marketers for the effective supply chain. Policy makers and other stakeholders should find a way of introducing threshing, dehulling and sorghum milling machine in the area which will encourage sorghum production and marketing.

DECLARATION

I, NATHALIA PATRICK MOSHA do declare to the Senate of Sokoine University of Agriculture that the work presented here is my own, and has not been submitted for a higher degree award in any other University.

_____ _____

Nathalia Patrick Mosha Date

(MSc. Candidate)

The above declaration is confirmed

_____ _____

Dr. Evelyne Lazaro (Mrs.) Date

(Supervisor)

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DEDICATION

I would like to dedicate my work to my late father Patrick Mosha. My farther i loved you so much but God Almighty loved you most. May your soul rest in peace Amen.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

LIST OF ABBREVIATIONS AND SYMBOLS

DALDO	District Agriculture and Livestock Development Office
FAO	Food and Agricultural Organization
FNT	Fews Net Tanzania
Kg	Kilogram
Km	Kilometer
MM	Market Margin
MRP	Minjingu Rock Phosphate
MDB	Marketing Development Bureau
MT	Metric Tone
NGOs	Non-Government Organizations
NIE	New Institutional Economics
PADEP	Participatory Agriculture Development and Empowerment Project
POP-SM	President Office Public Service Management
SCC	Supply Chain Council
SGR's	Strategic Grain Reserve
SIDO	Small Industry Development organizations
SPSS	Social Packages for Social Sciences
TFSU	Tanzania Food Security Update
TZS	Tanzania shillings
URT	United Republic of Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Sorghum is cultivated across the world in the warmer climatic areas. In terms of volume it is the world's fifth most important grain crop, after wheat, maize, rice and barley (ISB, 2007). Sorghum is still largely a subsistence food crop, but is increasingly becoming the foundation for successful food and beverage industries (ISB, 2007). India is the largest producer (7.06 million tones) of sorghum in the world after USA and Nigeria and has the largest area under sorghum crop of 9.5 million ha (FAOSTAT, 2002).

In Tanzania, sorghum and pearl millet are the third and fourth mostly widely grown cereal grain crops after maize and paddy (URT, 2006). The total production of sorghum during the agriculture census year 2003 was 216 152 tones. Production has remained more or less constant from 1987 to 2003 (URT, 2006). Less than 2% of the harvested sorghum enters the formal markets; the remainder is consumed on the farm (Rohrbach and Kiriwaggulu, 2007). Sorghum is an important food crop and income source for many rural households particularly those in semi arid area's which include Dodoma, Singida, Tabora, Shinyanga and Mwanza region (Rohrbach and Kiriwaggulu, 2007). The main contribution of sorghum is for farm household food security and lack of a commercial market has limited farmer's interest in improving the management of this crop (Rohrbach and Kiriwaggulu, 2007). According to FAOSTAT (2008), the estimates of sorghum yield in Tanzania for four consecutive years are 971; 1 000; 1 011.2 and 1 000 kg/hector for 2004, 2005, 2006 and 2007respectively.

Increasing sorghum productivity in the semi-arid zone of Tanzania will therefore be a continuing priority for both food security and household income. In sorghum consuming districts sorghum that enters the market competes strongly with maize, particularly when purchase are made for the national Strategic Grain Reserve (FNT, 2004).

Institutions can play an important role in linking farmers to markets; there is emerging consensus that governments have also a significant important role in helping institutions in forms of collective action to emerge that will effectively reduce transaction cost of market entry and participation by smallholders (IFPRI, 2003).

This study will be an attempt to investigate the transaction cost along the sorghum supply chain, identifying institutions in the study area that support sorghum production for efficient supply chain. Also explore and suggest ways of linking farmers with chain actors in order to reduce transaction costs along the chain hence increase sorghum production and marketing in the study area.

1.2 Problem statement and justification

Sorghum is one of the important crops in the economy and livelihood of the people in most semi arid area. In early 1980's the government of Tanzanian initiated the National Sorghum and Millet Improvement Programme (NSMIP) for the purpose of improving sorghum varieties, technologies and dissemination to smallholder farmers. Through the programme number of improved varieties such as *Pato*, *Macia*, *Wahi* (P9406) and *Hakika* (P9405) have been developed and disseminated for public consumption (Mwanga, 2002; Mbwaga *et al*., 2006).

The area planted with sorghum in Tanzania between 1986 to 2005 ranged from 580,000ha to 860 000ha producing 0.61 million tones grain (Mbwaga *et al.,* 2006). The dismal performance of sorghum is due to lack of market information, lack of quantity and quality sorghum supply, inadequate coordination between institutions and farmers, and lack of legal sorghum contract farming in Tanzania (Mbwaga *et al.,* 2006).

In developing countries including Tanzania small holder farmers find it difficult to participate in market because of a range of constraints and barriers including transaction costs. Transaction cost may also be reflected in hidden costs that make access to markets and productive assets difficult. Transaction cost that is observable and non- observable costs associated with exchange are the embodiment of access barriers to market participation by resource poor smallholders (Coarse, 1996; Delgado, 1999, Halloway *et al*., 2000 in Makhura, 2001).

Several studies have been conducted to promote sorghum production. These include studies like sorghum and millet marketing and utilization in Tanzania by Minde and Rohrbach (1993); adoption of improved technologies for sorghum and pearl millet by Mwanga (2002); and effect of intercropping pattern on incidence of striga and sorghum yields by Robble (2001). Nevertheless, little has been researched on role of institutions and transaction costs in sorghum supply chain. It is anticipated that the findings from this study will provide information that would enable policy makers to formulate and modify the policy in order to improve sorghum production and marketing in semi arid area.

1.3 Objectives of the study

1.3.1 General objective

The general objective of the study was to assess the role of institutions in supporting sorghum production and marketing and examine transaction costs in the sorghum supply chain in Singida rural district.

1.3.2 Specific objectives

The specific objectives of the study were to:

i. Identify types and role of institutions that are influencing sorghum production and marketing in the study area;
ii. Identify transaction cost incurred by supply chain actors;
iii. Determine price and market margin along the chain actors;
iv. Investigate the constraints faced by the identified institutions in supporting sorghum supply chain in the study area.

1.3.3 Research questions

The study was guided by the following questions which were used to address the study objectives.

i. Is there any institution(s) supporting sorghum production in the study area?
ii. What are the transaction costs incurred by chain actors in the study area?
iii. What are the prices and market margin along the chain actors?
iv. What are the institutional constraints experienced/identified in supporting sorghum supply chain in the study area?

1.3.4 Organization of the study

This study is organized into five chapters including the introduction. The fist chapter discusses the general background to the study, presents the problem statement, study objectives and research questions. The second chapter presents the review of literature relevant to the study. Chapter three gives the detailed description of the methodology employed in this study. Chapter four presents the findings and discussion of the study results while chapter five gives the summary of the major findings, concluding remarks and commendations from the study.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Institutions defined

New Institutional Economics defines institutions as the rules that govern social interaction. They are the rules of game both formal (laws, contracts, political systems, organizations and market) and informal (norms, traditions, customs, value systems, religions, sociological trends) that facilitate coordination or govern relationships between individuals or groups (North, 1990). According to Kherallah and Kirsten (2001), institution environment as understood by New Institution Economics (NIE) refers to the rules of the game as they affect behavior and performance of economic actors and in which organizational firms and transactions are embedded. Institutions emerge to minimize transaction costs and to facilitate market exchange (North and Thomas, 1973).

2.1.1 Role of institutions in strengthening market access for commodities

Institutions plays an important role in strengthening markets for commodities produced, brought and sold by smallholders, reducing transaction costs, managing risks, building social capital, enabling collective action, providing financial assistance and reducing missing market (Torero and Gulati, 2004). It is thus clear that the institutional infrastructure to facilitate market exchange is critically important for small holder agriculture (Torero and Gulati, 2004). Through efficient operations of these institutions smallholders access to market is improved. However the exact nature of infrastructure and institutions that can enable the small farmers transcend from the subsistence farming of the village economy to actively participate into market economy would vary from country to country and between farmers (Gabre-Madhin, 2001).

Financial institutions have an important role to play in smallholder marketing because smallholder farmers lack assets (Kashuliza, 1994). The adoption of capital intensive technologies, which would result in increased production such as processing, requires high capital investment. However, smallholder farmers do not have assets to meet this investment (Kashuliza, 1994). Further more, the financial system in developing countries is much less developed with a much narrower range of institutions and instrument and being smaller relative to the size of the economy.

Another role of institutions is provision of inputs and credit to farmers. Kherallah and Kristen (2002) indicated that, the withdrawal of parastatals from this role in many developing countries has not been replaced by the private sector. Because of high transaction costs (including information costs), inability to enforce contract with farmers, and thin markets, private traders are unwilling to provide input and credit to farmers. As a result, there is market failure in the provision of credit to rural household and farmers are unable to finance the purchase of agricultural inputs such as improved seeds and fertilizers.

Cooperative and farmer organizations are institutional arrangements, whose main role has been to organize small scale farmers in developing countries. The advantage of organizing farmers in groups include, among other factors, a reduction in transaction costs of accessing input and output markets, as well as improving the negotiating power of smaller farmers visa vie large buyers or sellers (Cook, 1995; Cook and Iliopoulos, 2000).

Grades and standards are another set of institutions that play a crucial role in providing internationally recognized information and quality assurance about a product, thereby reducing information and transaction costs and facilitating trade (Coulter and Onumah,

2002). However, grades and standards can also be used as non-tariff barriers to trade. Thus, imposition of minimum standards that can be met by small farmers is important for small farmers' access to markets (Reardon *et al.*, 2001).

2.2 Transaction costs

2.2.1 Transaction cost defined

A transaction cost is a cost incurred in making an economic exchange (restated: the cost of participating in a market). For example, most people, when buying or selling a stock must pay a commission to their broker, that commission is a transaction cost of doing the stock deal (Http://en.wikiepidia.org/wiki/transaction_cost.). Neoclassical economics and more recently New Institutional Economics (NIE) relate transaction costs to the non-price costs of making a commercial exchange (Collinson *et al.*, 2005). For instance, the expenses incurred in finding someone to trade with, time spent negotiating a deal and the cost involved in ensuring that the contracts are honored, all fall within the general category of transaction costs (Collinson *et al.*, 2005). Williamson (1996) identifies the critical dimension of characterizing a transaction and links it to the institutional governance structure of transactions. According to Williamson, transaction cost includes the cost of gathering and processing the information needed to carry out a transaction, cost of reaching decisions, cost of negotiating contracts, policing and enforcing those contracts.

Hubbard and Weiner (1991) have argued that economic activities do not occur in a frictionless environment. The main reason for this is the cost of carrying out the exchange. To carry out market transaction to facilitate exchange, institutions incur some transaction costs. In other cases, transaction costs were classified as observable and unobservable or inhibitive transaction costs. The observable transaction costs include marketing cost such as transport, handling, packaging, storage and spoilage. These are observable when a

transaction takes place. The unobservable transaction costs include costs of information search, bargaining, screening, monitoring, coordination, enforcement and product differentiation (Delgado, 1995).

2.2.2 Sources of transaction costs

Transaction costs emanates from a number of sources (North, 1991):

(a) Searching of information.

Transaction costs thus originate typically from the following activities: the search of information about potential contracting parties, prices and quality of the resources in which they have property rights, the bargaining that is needed to find the true position of contracting parties, making of contracts, monitoring of contractual partners to see whether they abide to the terms of contract, the enforcement of contracts and collection of damages when partners fail to observe their contractual obligations (Hubbard and Weiner, 1991).

(b) Poor infrastructure

Poor infrastructure including rural road networking is another factor which leads to high transaction cost.

(c) Distance to market place

In the first place, small-scale farmers are located in remote areas far away from service providers and major consumers of farm products.

(d) Institutional problems

Transaction cost results from institutional problems, such as the absence of market. The presence of transaction cost is often reflected by the difference or discrepancy between perceived buying and selling prices (Sadoulet and de Janvry, 1995). When these discrepancies occur, sellers experience low selling prices and consequently might feel discouraged to sell, while buyers experiencing a high buying prices, become discouraged to buy.

2.3 Supply chain

Supply chain is defined as the network of retailers, distributors, transporters, storage facilities and suppliers that participate in the sale, delivery and production of a particular product (SCC, 2005)**.** The primary focus in supply chains is on the costs and efficiencies of supply and the flow of materials from their various sources to final destinations and efficient supply chains reduce costs (SCC, 2005). A common phenomenon found in several developing countries is the long supply chains caused by the personalized nature of trade and actor specific transaction costs. A study by Gabre-Madhin (2001) describes the supply chain in the Ethiopian grain market where brokers and middlemen play an important role in trade facilitation and lowering the transaction costs between unknown parties. The extensive supply chains and the use of brokers are not unique for Sub-Saharan Africa, but similar findings have also been observed, for example in India (Lele, 1971) and (Scott, 1985) in Gabre-Madhin (2001). The weak market institutions and long supply chains may lead to a large wedge between the price paid by the consumer and the price received by the producer.

2.4 Sorghum marketing

The marketing of agricultural products in many developing economies is a major determinant of development in general and agricultural development in particular (Ashimogo *et al.*, 2003). The marketing of produce has a direct relationship to farmer's income (Msuya, 2003). Timely marketing and finding the right buyers who pays at the right time is important in the whole cycle of farming (Msuya, 2003).

In Tanzania, the government decision to include sorghum in the Strategic Grain Reserve (SGR) is highly welcome, as the SGR will provide a reliable market for sorghum. Through

the SGR the government could also set sorghum prices purposely to give smallholder farmers the impetus to grow varieties suitable for consumption as food (FNT, 2004).

Sorghum marketing in Singida rural district is local and regularly organized weekly, biweekly or monthly (Mbwaga *et al.*, 2006). Sorghum farmers sell their produces to other farmers in the village, local market and others to urban traders who buy the produce at lower prices during the harvest season and sell the produce to the urban market. Sorghum grain has high market potential in Tanzania if farmers are linked to markets through farmer groups (Mbwaga *et al.*, 2006). The estimation of sorghum requirement by different buyers in Tanzania is shown in Appendix 1.

2.5 Constraints on access to markets by smallholder farmers

Marketing access is a major constraint for capturing the available opportunities for small-scale farmers (Broken, 1990). These marketing problems have to be addressed if the agricultural sector has to realize its full potential in stimulating broad based agricultural and economic development (IFAD, 2001), without market access, the potential benefits of higher producer prices and lower input prices are not transmitted to the poor farmers.

According to IFAD (2001), the problem of market access by smallholders may be considered in three dimensions: the physical (the distance to the market); the political (ability to influence terms upon which they participate in markets); and the structural (the lack of market intermediaries). All of these must be tackled to ensure the desired effects on production, output or income, and most important low transaction costs.

2.5.1 The physical dimension of market access

Infrastructure in many developing countries, especially in rural areas where most of agricultural activities take place, tends to be dilapidated or non-existent. The lack of passable roads in many rural areas means that it is difficult for the rural poor to market their produce and the costs of doing so are much higher than they would be if transport was easier (IFAD, 2001; Omamo, 2001). Moreover, the flow of market information depends on the condition of the physical infrastructure. Poor rural infrastructure implies that either traders cannot travel to, or communicate with rural areas to purchase the output of the poor. This limits the number of traders who go to the rural area to collect produce and hence eliminate competition and the bargaining power of the small farmers (IFAD, 2001).

2.5.2 Political dimension of market access

In many countries, small producers in the agricultural, manufacturing and service sectors are constrained by heavy and often incomprehensible bureaucratic regulations and other barriers that can limit their ability to enter into the market economy or to take advantage of the few opportunities available (World Bank, 1996). Many statutory procedures, such as registering, licensing and start up taxes, can place a disproportionate cost on micro firms and hence limit their access to markets. The roles of institutions and policies also have a profound influence on market access and development of the rural economies (Minot and Ngigi, 2004; URT, 2005). Institutions that lower transaction cost are important to ensure market access of smallholders. But in most of the developing countries such as institutions (for credit, risk management, input supply and output marketing) are not well developed and hence limit smallholders to take advantage of new opportunities and participation to markets (IFAD, 2001).

2.5.3 The structural dimension of market access

Many rural markets are characterized by extreme asymmetry of relations between, on the one hand, large numbers of small producers/consumers and, on the other hand, few buyers/sellers. Such market relations are inequitable, frequently uncompetitive, and rarely to the advantage of the small producer (IFAD, 2001).

Traders are essential lifelines for remote rural people, providing opportunities to sell agricultural produce and to purchase inputs and consumer goods. Traders, especially if they are irregular or face little competition, may not be much concerned about their reputation. In such cases, asymmetric information often forces the poor to accept low prices for products and to pay high prices for consumer goods (IFAD, 2001).

Most often, the cost of exchange varies depending on the personal relationship between the two parties, and since the transaction costs are specific to each market actor, there is no single effective price at which exchange occurs (Sadoulet and de Janvry, 1995). Each market actor operates according to the specific transaction costs they face, and as the transactions are dependent on personal relationships and the supply chains are usually long. As the number of transactions needed to get the goods from the original seller to the final consumer grows, so do the marketing margins leading to thin or absent markets between sellers and buyers (Gabre-Madhin, 2001).

2.6 Access to market information by smallholder farmers

Inadequate market information, especially on price is a major obstacle to the performance of any market system and the production system of the sector (Mlambiti, 1999). A study by Nyange *et al. (*2000) found that, marketing information concerning potential fruits markets and prevailing prices among farmers was obtained from various sources such as

friends and relatives (45%), own investigation at local markets (31%), and traders who directly come to the farm (24%). The farmers argued that, reliance on friends for information could limit the flow of the up dated information; and the information from some exploitative traders, on the other hand, could be misleading because middlemen are relatively well informed of the market situation compared to farmers. Also Nyange *et al.* (2000) found that, none of the farmers mentioned radios as the source of information. These observations have the implication that there is insufficient communication linkage between farmers and major urban markets (consumers) that would probably guide their market decisions and price control.

2.7 Market Margin

The market margin is the difference between prices at two market levels. The term market margin is commonly used to refer to the difference between producer and consumer prices of an equivalent quality and quantity of a commodity. However, it may also describe price differences between other points in the supply chain, for example between producer and wholesale or wholesale and retail prices (Pomeroy and Trinidad, 1995). The easiness to understand and forecasting the ability of rational variants for the operational structure of an enterprises or individual farmers is the important advantage in the use of market margin models. The main disadvantage of the models relates to their inability to take into account the costs involved in the market chain.

Market margins are important to estimate due to the fact that, intermediary market participants are very often reported to receive low shares of the total market values. Ashimogo and Lazaro (1989) in their study of the marketing channels for horticultural products in Morogoro District and Dar es Salaam show that, marketing margins were

highest for truckers who delivered the product to the city for wholesale. Transport cost contributed about 37% to 40% of the total costs along this channel.

Similarly, Nyange (1993), in his study of the economics of vegetable in Arumeru district shows that, the trucker’s margin were larger than margins at wholesale level with transport costs constituting about 30% to 35% of the total costs from producer to wholesale markets.

CHAPTER THREE

3.0 METHODOLOGY

3.1 Overview

This chapter discusses research design and related matters of the study area. This chapter has the following sections namely description of study area, research design, sampling design and sample size, data collection, data processing and analysis.

3.2 Description of the study area

3.2.1 Location

Singida rural district is one of the four districts in Singida region. The other districts are Manyoni, Iramba and Singida Municipal. The district lies between 3^0 and 7^0 latitudes south of the Equator and 34^0 and 35^0 longitudes East of Greenwich. The district is bordered by Tabora region to the West, Iramba district in the North, Hanan'g district in the East, Kondoa district in the South-East and Manyoni district in the South. The map showing the Singida Rural boundaries and the study area is shown in figure 1.

3.2.2 Climate and topography

The district has a semi arid climatic condition. There are two seasons; the dry season which is the longest season from April to November and the rainy season which starts in December to March. The average rainfall is between 600mm-700mm per annum while the average minimum temperature is 15^0C-30^0C. The land area is part of the highland of the central plateau (along Mtinko and Ilongero division) and the remainder of the district is composed of lowlands and plains in the south.

3.2.3 Human population

Singida rural district is estimated to have a population of 429 498 of whom 220 498 (51.2%) are females and 209 403 (48.8%) are males living in 85 464 households with an average family size of 5.1 (URT, 2003).

3.2.4 Land area

Singida district has an area of 12 164 square kilometers (km^2) of which 55 282 km^2 is used for agriculture, 373.2 km^2 for grazing land is 373.2 km^2, 2 200 km^2 for forests and shrubs and 50 km^2 is covered by water in the form of lakes, dams and rivers. The remaining part of the district 89.8 km^2 is used for mining sites, hills or rocks.

3.2.5 Socio economic activities

The major economic activities in the district are farming and livestock keeping. Other activities include fishing, beekeeping, small-scale mining, small businesses, cottage industry, and lumbering. Food and cash crops are grown in the district. Food crops grown include maize, sorghum, millets, paddy, beans, cassava and sweet potatoes. Cash crops include sunflower, groundnuts, finger millet, yellow peas, coriander, onions, simsim, cotton, and other newly introduced crops like pigeon peas, cashew nuts and *mlonge*. Small-scale farmers account for 40% of the economic activities, pastoralists 20%, agro-pastoralists 30% and mixed farmers 10%.

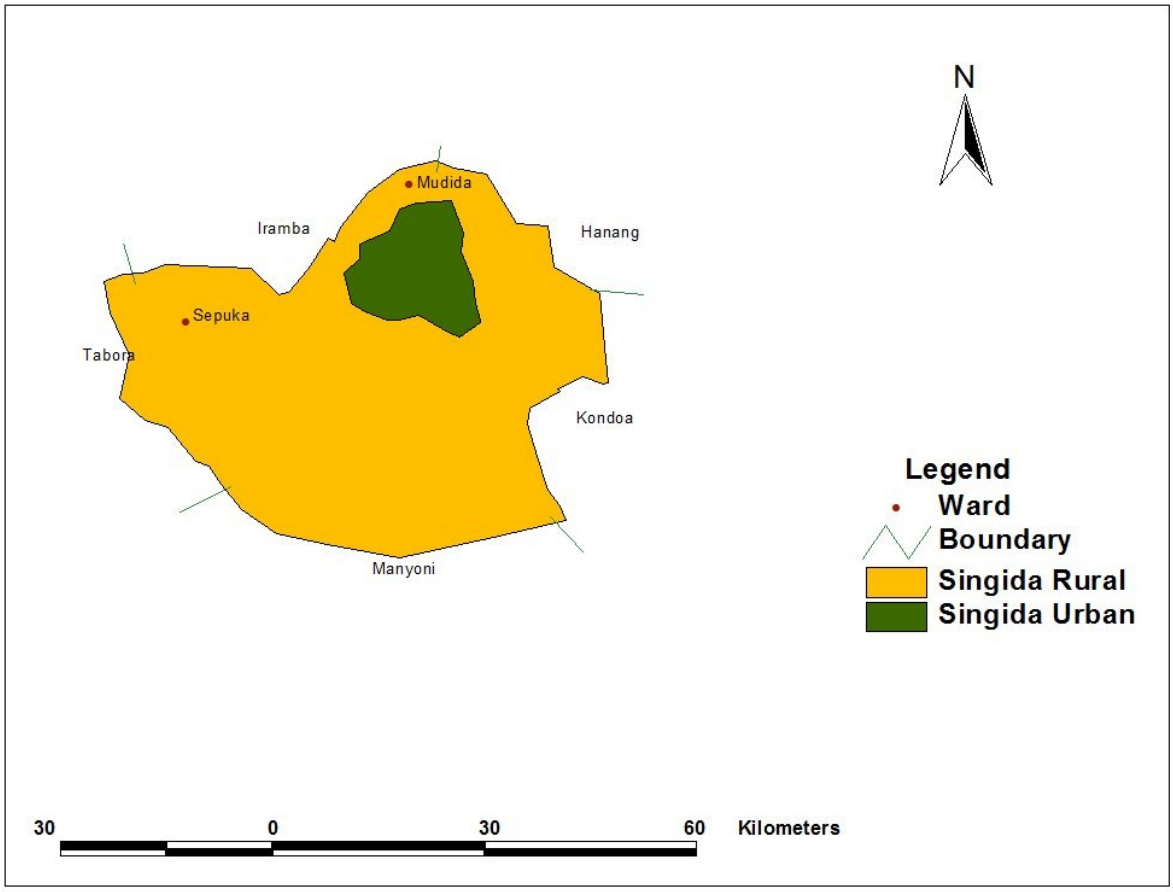

Figure 1: Map showing Singida Rural District as a case study

3.3 Design of the study

Purposive sampling technique was employed at the first stage, where by two wards Mudida and Sepuka were selected based on their high potential in the sorghum production area in the district. Four villages were selected 2 villages from each ward. The villages are as follows Mudida, Kibaoni, Msimi and Msungua.

3.4 Sampling Design and Sample size

Respondent selection was based on simple random sampling and purposive sampling. A sampled 60 respondents was selected, 9 traders in the villages and Singida urban market. The traders were involved in transporting, buying and selling sorghum in the district as well as in the region. Nine key informants composed of farmers group, traders, financial

institutions, Mpambaa Seed Farms, Input suppliers, PADEP, FAO, SIDO, the district Agricultural and Livestock Department Office. The sample size was selected in order to capture all actors along the supply chain.

3.5 Data collection

Both secondary and primary data were collected. Secondary data were collected in order to provide information on institutions, transaction costs, sorghum production and marketing.

3.5.1 Secondary data collection

The secondary data were extracted from reports and other documentary materials from relevant bodies such as Singida District Council, National Bureau of Statistics (NBS), Ministry of Agriculture Food Security and Cooperative (MAFSC), Sokoine National Agricultural Library (SNAL) and different websites on the internet.

3.5.2 Primary data collection

Primary data were collected from different sorghum farmers, traders and different institutional support organizations by using questionnaires, checklists and informal discussions. Questionnaires were used to collect information from 60 farmers and 9 traders. The questionnaire was pre-tested in a pilot survey in the district in order to determine their relevance and the quality. After the pre testing, the questionnaires were revised to obtain the final version shown in Appendix 2.

Field interviews were carried out December 2007 and January 2008. Interview with farmers were carried out at farmers farm and trader’s interview were carried out at their selling place in the village centers and the urban trader’s interview were carried out at Singida urban market where transactions were taken place.

Informal interview was carried out to obtain information from key informants using a checklist (Appendix 3) in order to obtain information from different institutional arrangements including those from Participatory Agriculture Development and Empowerment Project (PADEP), FAO-Emergency programme, farmer's organizations, Small Industry Development Organizations (SIDO), Input suppliers, District Agriculture and Livestock Development Officer (DALDO) office and Mpambaa seed farm.

3.6 Data Processing and Analysis

3.6.1 Descriptive analysis

The analysis is based on descriptive statistics which maps the responses, characteristic and trend of some of the data and information. Responses from the interview were coded, summarized and compiled using the Statistical Package for Social Sciences (SPSS Version 12.0) software to generate descriptive statistics such as frequencies and percentages. A cross tabulation programme was used for bivariate analysis to study the relationship between a pair of variables.

3.6.2 Market margin analysis

Market margin represents the price charged for one or a collection of marketing services. For example the difference between producer and consumer or retailer's price is the amount charged for all the marketing services rendered between production and consumption or retail place, including buying, transport, storage, processing and market fees. Under competitive conditions, the size of market margin would be the outcome of the supply and demand for marketing services, and they would equal the minimum costs of services provision plus normal profit.

For the purpose of this study, the marketing margin analysis was represented by

MM = Sprice – Bprice

Where:

MM = Market margin between market level 1 and market level i-1 in TZS /kg

Sprice = Selling price at market level i in TZS/kg

Bprice = Buying price at market level i-1 in TZS/kg

3.6.3 Correlation analysis

In this study, correlation analysis was used to test the extent to which market margins are statistically associated with buying and selling prices of sorghum consumed.

3.7 Data limitations

The following are the problems that were encountered during the data collection exercise.

i. Farmers and traders were poor in record keeping. Farmers in the surveyed area do not keep records of their last production or cost encountered during sorghum production. Traders conduct trade activities without recording somewhere for the reference. Apart from recording keeping there was skepticism in provision of information. The problem was minimized by careful probing the interviewee.

ii. Conventions of local units of measurement to standard weights and measures were also a problem since some farmers/traders use local units (e.g. Overfilled bags). The problem was solved by using a tin as a unit of measurement. Six tins was used to represent 1 bag (100 kg) of sorghum

However, in spite of the above limitations, it is expected that the data collected was reliable and adequate to address the objectives set forth in the study.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 Introduction

This chapter presents the results and discussion for the data obtained from the study. The results are divided into two sections. The first section presents the descriptive statistics showing frequencies, percentages, means and general characteristic of the respondent sorghum growers and traders and the second one represent the market margin attained by the traders and problems which are faced during the production and marketing of sorghum in the study area.

4.2 Respondents social economic characteristics

4.2.1 Age structure

The mean age of the respondents was 45.5 years with the maximum age of 85 years and minimum age of 25 years respectively. However, the majority (57 %) of the respondents were between 18-45 years, 43 percent were above the age of 45 years (Table 1). The largest proportion of interviewed farmers reported the participation of youth on farming activities rather than doing either off-farm or non-farm activities. This implies that sorghum production is done by large number of the economically active population in the study area.

4.2.2 Gender

Majority of the interviewed farmers (83 %) were males and the remaining 17 % were females (Table 1). The smaller percentage of female respondent is due to the fact that the interviews were administered to heads of the households, the majority of whom were man.

This is a common to African traditions where most societies are patrilineal, and such circumstances, husbands are in most cases the heads of households.

4.2.3 Marital status

Majority (95 %) of the interviewed sorghum producers in the study area were married. Few (3 % and 2 %) were single and widowed respectively (Table 1). This is an indication that society is stable with a large percentage of married respondents. The stable family can concentrate more in production than unstable ones and this influences agricultural production in the area.

4.2.4 Education level

Education is one of the long –term strategies that may be used to improve agriculture in developing countries like Tanzania. This study showed that, 93 % of respondent completed primary education and the remaining 7 % had not attained any formal education (Table 1). This indicates that sorghum farmers in the study area are literate and can therefore make use of extension messages.

Table 1: Summary of some social-economic characteristics of sampled farmers

Characteristics	Village name				Total sample
	Msimi (N=15)	Msungua (N=15)	Mudida (N=15)	Kibaoni (N=15)	
Age distribution					
18-45	6(40)	10(67)	7(47)	11(73)	34(57)
> 45	9(60)	5(33)	8(53)	4(27)	26(43)
Total {N (%)}	**15(100)**	**15(100)**	**15(100)**	**15(100)**	**60(100)**
Gender					
Male	13(87)	11(73)	13(87)	13(87)	50(83)
Female	2(13)	4(27)	2(13)	2(13)	10(17)
Total {N (%)}	**15(100)**	**15(100)**	**15(100)**	**15(100)**	**60(100)**
Marital status					
Married	15(100)	14(93)	13(86)	15(100)	57(95)
Single	NA	1(7)	1(7)	NA	2(3)
Widowed	NA	NA	1(7)	NA	1(2)
Total {N (%)}	**15(100)**	**15(100)**	**15(100)**	**15(100)**	**60(100)**
Education level					
No formal education	1(7)	2(13)	1(7)	NA	4(7)
Primary education	14(93)	13(87)	14(93)	15(100)	56(93)
Total {N (%)}	**15(100)**	**15(100)**	**15(100)**	**15(100)**	**60(100)**

Figures in the parenthesis are percentages

N= Number of the respondent

4.2.5 Main source of income

The results in Table 2 show that 51.7 % of the interviewed farmers depend on sales of food and cash crops as their main source of income. The results imply that farming is the major source of employment to the majority of rural people in Singida rural district. This finding is consistent with the finding by Amani (1992) where about 85 % of agriculture in

Tanzania is carried out in rural areas and is a source of income to majority of rural families in the country.

Table 2: Respondents main sources of income (n=60)

Source of income	N	Percent
Sales of food and cash crop	31	51.7
Sales of livestock and its product	10	16.7
Sales of food, cash crops and livestock	11	18.3
Petty trade	8	13.3
Total	**60**	**100.0**

N=Number of responses

4.3 Traders characteristics

4.3.1 Age of trader

Table 3 shows the age of sorghum traders in Singida rural district. The majority of the traders (88.9 %) are between 28-45 years and remaining 11.1 % of traders are aged above 45 years. The maximum age of the sorghum traders was 50 years while the minimum age was 28 years with a mean of 37.4 and standard deviation of 7.6. The majority of traders fall on the active age group that are strong and can actively engaged in grain trading in their respective markets. Ages influences the income generating capacity of an individual.

4.3.2 Gender of the traders

Sorghum trading is dominated by male compared to female traders. The results in Table 3 show that, 88.9% of the sampled traders were male and only 11.1% were female. Table 3 also shows that all of the traders interviewed were married. This result indicates that participation of females in sorghum trading was relatively low. The reasons behind is that grain trading in Tanzania is sophisticated, it requires healthy and masculine individuals to

undertake the business. Also it involves sometimes traveling, weight (bags) lifting and other vigilant activities. This can be performed more by male than female.

4.3.3 Main occupation of the sampled traders

The results in Table 3 show that 55.5 % of the sampled traders were also involved in farming activities. These include all traders who live in the villages but the remaining 44.4 % concentrated on trading business only. Sorghum traders also engage in other activities for the purpose of generating income during the off-season period.

4.3.4 Nature of the business

Table 3 shows that the nature of trading business was full time as reported by 55.6 % of the interviewed traders while part time trading was reported by 44.4 % of interviewed traders. Traders in urban market conduct full time trading but village traders' conduct part time trading because they are doing other activities like faming.

Table 3: Traders characteristics

Characteristic	Traders in			Total sample
	Mtinko (n=3)	Msungua (n=3)	Urban market (n=3)	
Age of the traders				
18-45	3(100.0)	3(100.0)	2(66.7)	8(88.9)
>45	NA	NA	1(33.3)	1(11.1)
Total {n (%)}	**3(100.0)**	**3(100.0)**	**3(100.0)**	**9(100.0)**
Gender of the traders				
Male	2(66.7)	3(100.0)	3(100.0)	8(88.9)
Female	1(33.3)	NA	NA	1(11.1)
Total {n (%)}	**3(100.0)**	**3(100.0)**	**3(100.0)**	**9(100.0)**
Marital status of the traders				
Married	3(100.0)	3(100.0)	3(100.0)	9(100.0)
Total {n (%)}	**3(100.0)**	**3(100.0)**	**3(100.0)**	**9(100.0)**
Main occupation of the traders				
Trading only	1(33.3)	NA	3(100.0)	4(44.4)
Farming and trading	2(66.7)	3(100.0)	NA	5(55.6)
Total {n (%)}	**3(100.0)**	**3(100.0)**	**3(100.0)**	**9(100.0)**
Nature of the business				
Full time	1(33.3)	1(33.3)	3(100.0)	5(55.6)
Part time	2(66.7)	2(66.7)	NA	4(44.4)
Total {n (%)}	**3(100.0)**	**3(100.0)**	**3(100.0)**	**9(100.0)**

4.4 Sorghum production

Sorghum is among the main food crop produced in Singida rural district followed by pearl millet and maize. Sorghum is produced in the area due to its ability to tolerate drought. Sorghum varieties grown in the area are local landraces (*Langalanga*) and improved varieties *wahi*, *hakika*, *pato* and *macia*. The improved varieties were introduced in the area by ARI-Ilonga since 2003. The same varieties especially *wahi*, *pato* and *macia* were also available at Mpambaa Seeds Farm and from stockiest in the region. Farmers in the surveyed area preferred to grow more than one sorghum variety in their farm. The improved varieties were introduced in the area due to the characteristics stated in Appendix 5.

The results in Table 4 show that, respondents cultivate as many as three sorghum varieties. About 76.7 % of the respondents grow three types of sorghum varieties on their farm, with different combinations but always including the local land race (langalanga). 31.7% cultivate *langalanga*, *wahi* and *hakika*, 23.3 % of the respondents cultivate *langalanga, pato* and *wahi* and 21.7 % grow *langalanga*, *pato* and *macia.* The inclusion of local land race as indicated by the respondents is because traditionally local varieties are more palatable than the improved varieties; it has endosperm that increase their resistance to pest attack and it is grown as security in the study area.

Table 4: Sorghum variety grown in the District (n=60)

Sorghum variety	Number of respondent	Percent
langalanga	4	6.7
Wahi	3	5.0
Pato	1	1.7
Macia	1	1.7
langalanga,wahi, hakika	19	31.7
langalanga, pato and macia	13	21.7
Langalanga and pato	5	8.3
Langalanga, pato and wahi	14	23.3
Total	**60**	**100.0**

Sorghum production varied across villages and among farmers. The interviewed respondents reported that, sorghum production was estimated at an average mean of 655.60 per household with the maximum production of 1800 kg/acre and minimum production of 20 kg/acre per household (Table 5). Minimum production was observed in the study area due to unreliable rainfall in that season. Sorghum sold was estimated at an average of 147 kg per household with maximum quantity sold being 500 kg. The interviewed respondent reported that, not all sorghum produced is sold; the quantity sold is for solving other obligation. The results revealed that, the minimum sorghum production

in the study area due to unreliable rainfall, presence of disease and pests, poor agronomic practices and bird's problems might have contributed.

Table 5: Sorghum production and sales by respondent

	N	Minimum	Maximum	Mean	Std. Deviation
Sorghum production (kg)	60	20	1800	655.60	453.863
Sorghum sold last season (kg)	60	.00	500.00	146.7000	147.07029

The major problem facing sorghum producers are shown in Table 6. Among the mentioned problems is unreliable market as reported to be important problem by 31.7 % of interviewed farmers, unreliable rainfall was mentioned by 28.6 % of responses, bird's problems especially quelea quelea was mentioned by 27.5 % of responses. The study revealed that, unreliable sorghum market discouraged farmers to produce more sorghum hence produce other crop like sunflower in the study area.

Table 6: Major sorghum production problem (n=60)

Problems	Number of respondent	Percent
Unreliable market	60	31.7
Unreliable rainfall	54	28.6
Birds problem	52	27.5
lack of enough capital	13	6.9
Poor infrastructure	10	5.3
Total responses	**189**	**100.0**

Total adds up to 189 due to multiple response.

4.4.1 Major sources of seeds

The major sources of seeds reported by 49.3 % of responses were from friends/relatives. Other sources of seeds were from Mpambaa Seed Farm (15.5 %), Extension officers (15.5 %), ARI-Ilonga (8.1 %), private retailer shops (10.8 %) and own harvest (7.0 %) (Table7). The results indicate that, access of seeds to sorghum farmers depend more on purchase from friends and relatives and a few from Mpambaa seed farms, ARI- Ilonga and private sectors. 10.8% of the responses purchase sorghum from private retailers, respondent indicates that, the small percentage is due to lack of enough funds for purchasing seeds. Respondent indicate that, seeds from ARI Ilonga were improved varieties (quality declared seeds) and they were provided to farmers who belong to farmers group for free who in turn multiply it and sell the seeds to their fellow farmers in the village and those from Extension officer were from DALDOs Office which were sold to farmers. The landraces usually obtained from own harvest or from friends/relatives.

Table 7: Respondents response on source of sorghum seeds variety (n=60)

Source of seeds	Number of response	Percent
Own harvest	1	7.0
Mpambaa seed farm	23	15.5
ARI Ilonga	12	8.1
Purchase/given by Friends/relatives	73	49.3
Extension officer	23	15.5
Purchase from private retailers shops	16	10.8
Total responses	**148**	**100.0**

The total adds up to 148 due to multiple answers (Multiple responses)

4.4.2 Land holding by farmers

Results of land utilization for sorghum production are shown in Table 8. The majority (83.3 %) of respondent's farms had farm sizes of between 1-3 acre and remaining (16.7%) farm size was greater than 3 acre. It implies that, there is a minimum of one acre of farm size and maximum of six acreage with a mean of 2.0750. The results implying that the majority of the farmers in the study were small scale farmers. According to farmers' views, they could increase area under sorghum production if they are assured of reliable sorghum market.

Table 8: Area under sorghum production in 2006/07 season (Acre) (n=60)

Farm size (acre)	N	Percent
1-3	50	83.3
> 3	10	16.7
Total	**60**	**100.0**

4.4.3 Inputs used in sorghum production

The results in Table 9 shows that 52.2% of the interviewed respondent used improved seeds, 42.4% used animal manure and 5.4% pesticides as their inputs in their farms. Results also show that, the majority of the respondents reported that the use of pesticides and inorganic fertilizer was not common in the study area.

Table 9: The use of farm input in sorghum production (n=60)

Kind of input	Respondent (N)	Percent
Improved Seeds	48	52.2
Manure	39	42.4
Pesticides	5	5.4
Total responses	**92**	**100.0**

The total adds up to 92 due to multiple responses

4.4.4 Factors influencing sorghum production

The results in Table 10 shows that 33.0 % of responses produce sorghum due to its drought tolerance nature, 28.8 % for its high yield, 22.8 % for its early maturity and 15.1 % as a main staple food. The fact that sorghum is relatively more drought tolerant than other food crops like maize is the leading factor which influences farmers to grow more sorghum in the study area.

Table 10: Factors influencing farmers decision to produce Sorghum (n=60)

Reason	Responses	Percent
High yielding	52	28.8
Early maturity	44	23.8
Drought tolerance	61	33.0
Main staple food	28	15.1
Total	**185**	**100.0**

The total adds up to 185 due to multiple responses

4.4.5 Future plan with respect to area under improved varieties

Table 11 shows that the respondent's future plans with respect to improved sorghum varieties. The majority of respondent (86.7 %) plan to increase the area under improved varieties such as *wahi, hakika, pato* and *macia* while the remaining (13.3 %) did not. The reasons for this plan are that improved varieties are high yielding as indicated by 83.3 % of respondents, striga tolerance indicated by 13.3 % of respondents, early maturity crop as indicated by 1.7 %, while 1.7 % of respondents indicated that in future they will not increase acreage due inadequate area of production. Respondents also claimed that if they

were being assured of reliable market/reliable buyers they will increase the area under sorghum production.

Table 11: Future plan concerning total area under improved varieties (n=60)

Plan	Number of respondent	Percent
To increase	52	86.7
No change	8	13.3
Total	**60**	**100.0**

4.5 Sorghum consumption

The majority (91.7 %) of respondents consume sorghum stiff porridge (*ugali*) very often while (8.3 %) consume it occasional (Table 12). The results indicate that sorghum produced in the area is used mainly for food.

Table 12: Sorghum meals consumption by respondent

Sorghum consumption	Number of respondent	Percent
Very often	55	91.7
Occasional	5	8.3
Total	**60**	**100.0**

4.5.1 Post harvest processing of sorghum

Post harvesting of sorghum involves threshing, dehulling and grain grinding. In Tanzania, much emphasis in research has been on breeding to maximize yield. According to Lazaro (1999), little effort was directed to processing and utilization research. As a result, the dominant processing techniques are still traditional. Threshing is usually done manually by beating sorghum heads on the floor with stick. Grain dehulling is done by using motor and pestle and milling technology is done by milling machines that are available in the study area. The results show that 83.3 % of the respondents do not process sorghum after harvesting while the remaining 11.7 % use milling machines to process sorghum (Table 13). According to farmer's views, the main constraint to sorghum milling is the presence of stones and sands in sorghum grains. These results from the common practice

of threshing the grain on the ground and sweeping the threshed product into grain bags destined for the market without removing stones and sands. This study indicates that, there is strong need to advocate introducing threashing, dehulling and sorghum milling machines, which enable farmers to threash sorghum and sell clean sorghum as results changes of the sorghum recipes and value addition to sorghum.

Table 13: Respondent responses on sorghum processing after harvesting (n=60)

	Number of respondent	Percent
Yes	7	11.7
No	53	88.3
Total	**60**	**100.0**

4.5.2 Uses of sorghum

Sorghum is mainly used for making stiff porridge (*Ugali*) and porridge. Table 14 shows the list of other uses of sorghum at the household level. Sorghum is used for local brew preparation, *makande* preparation, *maandaz*i, pancake preparation, gift, animal feeds and dowry payment. The result shows that 42.4 % of respondent reported that they use sorghum for making local brews locally known as *togwa* or *magai* while the rest 26.3 % they used sorghum for making *makande*. This revealed that, sorghum produced in the study area is mainly used for food and local brewing. Informal interview with respondents indicate that sorghum is used also as medicine for cattle and human beings, the straws are used as a source of construction materials and fuel.

Table 14: Respondent response on other uses of sorghum other than stiff porridge (n=60)

Other uses	N	Percent
Animal feeds	5	5.1
Gifts	6	6.1
Dowry	4	4.0
For pancake preparation	8	8.1

Makande	26	26.3
Maandazi	8	8.1
Local brew(*togwa/ magai*)	42	42.4
Total responses	**99**	**100.0**

As a follow up, the study proposed a question intended to capture the consumption frequency of common grains for a week before the day of interview. The results show that sorghum was consumed most frequency, about 3 times a week as a meal, while maize had a frequency of 2 times a week and pearl millet had a frequency of 1 week. Table 15 shows the consumption of main staple food a week before the interview. This trend was observed during the interview and it can change according to the household preference.

Table 15: Consumption of selected type of food preparation by sample respondent a week before the study period December 2007

Food preparation type	Mean consumption frequency (times a week)
Sorghum (stiff porridge)Ugali	2.85
Maize ugali	2.00
Pearl millet Ugali	1.10
Sorghum porridge	0.7
Rice	0.6
Maize porridge	0 .33
Millet porridge	0 .116

4.6 Type of institutions and their roles in supporting sorghum production

Sorghum production and marketing depends not only on farmers who are producing the crop but also on the supporting institutional and organizational arrangement. The main institutions include governmental departments and private sector. The study identifies these institutions as financial institutions such as SACCOs, farmers groups, input suppliers, governmental departments and programs such as DALDO Office, Mpambaa

Seed Farm, SIDO, PADEP and research institutes (ARI Ilonga).The roles of these institutions are summarized in Appendix 6.

4.6.1 Financial institutions

Financial institutions have an important role to play in smallholder marketing because smallholder farmers lack assets (Kashuliza, 1994)**.** Credit availability is potential in augmenting the flow of returns to farm enterprises (Kashuliza, 1986). According to Mukwenda (2005) the shortage of credit is one of the limiting factors in operation and business expansion. Mukwenda (2005) mentioned further that, the reasons for not acquiring credit to be high interest rates, lack of awareness and lack of capital. The results (table 16) show that, only 3.3% of the respondents had access to credit from SACCOS while the majority 96.7% of the respondents did not had access to credit. The findings revealed that, despite the obvious need for financial services for agricultural producers, financial facilities for farmers are lacking. These results concur with Goodland et al., (1999) that access to financial services and in particular to funds for crop production is a severely limiting factor, that slows down inputs use (improved seed and seasonal labour) and output marketing (for example storage, transport and household level processing).

Table 16: Credit facilities by farmers (n=60)

Access to credit	N	Percent
Yes	2	3.3
No	58	96.7
Total	**60**	**100.0**

This is probably due to lack of knowledge and fear of loan defaulting which can result in bankruptcy. This argument is shown in Table 17 which reveals that respondents mentioned lack of knowledge on credit application (48.3 %) and high interest rate (36.7 %) and the

remaining 13.3% claimed that, they applied but no response and the rest have never applied for credit (1.7 %).

Table 17: The reasons for not applying for credit (n=60)

Reason	Frequency	Percent
Lack of knowledge on credit application	29	48.3
I applied but no response	8	13.3
I have never applied for credit	1	1.7
High interest rate	22	36.7
Total	**60**	**100.0**

The results indicate that institutional support in the form of credit provision is not well understood by farmers in the study area. Thus, for effective sorghum production and marketing, institutional support in terms of credit provision should be put in place (Kashuliza, 1986). Also credit access has to be augmented with sufficient farmer's management capacity to optimize benefit from credit. Traders in urban markets are more organized probably due to enforcement from their own organizations and therefore are able to dictate market prices compared to their counterparts who do not have any organization.

4.6.2 Farmers groups/associations

Farmers groups are important attributes for combining efforts in terms of looking for better markets and strength in bargaining and negotiating for better prices. Only 41.7% of respondents reported to be member of sorghum farmer groups. The remaining 58.3 % of the respondents were not members of any farmers' groups (Table18). Respondents who belong to sorghum farmers' groups where asked about the benefit of being a member. About 11.7 % claims that they market their produce easily, acquire input easily and improve their negotiation power compared to farmers who do not belong to such organizations. Through group formation sorghum farmers can raise enough capital to

finance expenses resulting from inputs and access market information easily. The finding concur with Cook and lliopoulos (2000), that organizing farmers in groups reduce transaction cost for accessing inputs and output market and improve negotiation power of smaller farmers.

Farmers groups supported by ARI-Ilonga managed to produce quality declared seeds which in turn sell it to their fellow farmers in the village. Time and cost of traveling to Singida urban to purchase sorghum seeds were reduced**.** The findings from this study revealed that, few farmers belong to sorghum farmer groups therefore effort is needed to encourage group formation thus aiming at reducing transaction cost for accessing inputs and market for their produce.

The main challenge faced by farmers groups in the study area were unreliable rainfall, birds problems, lack of reliable market and lack of threshing machines.

Table 18: Respondents involvement in groups (n=60)

Involvement in group	N	Percent
Yes	25	41.7
No	35	58.3
Total	**60**	**100.0**

4.6.3 Input suppliers

Input suppliers were identified in Mtinko ward and Singida town. One stockiest in Mtinko ward was selling seeds and agrochemicals. The type of seeds includes sorghum, maize, sunflower and vegetable seeds. The source of seeds was Mpambaa Seed Farms and input suppliers in Singida town. The input supplier plays an important role in providing seeds at the right time of the season and advice to sorghum farmers in the villages. Farmers in the

area used to purchase their seeds and other inputs from the stockiest situated near to their villages.

Five input suppliers were identified in Singida town. They sell seeds including maize, sorghum, sunflower, vegetable seeds, inorganic fertilizers and agrochemicals. The variety of sorghum seeds found in all the five shops was *macia.* The interview respondents indicate that, *macia* was the only sorghum varieties available in the wholesale stockiest. The inputs suppliers as private institutions play an important role in providing seeds and advices to sorghum farmers in the study area. The study revealed that, availability of this sector at the village level will enable farmer to acquire the input at aright time hence reduction of transaction cost of acquiring inputs.

The main challenge faced was low purchase of seeds from sorghum farmers due to lack of enough funds to purchase inputs.

4.6.4 Agriculture Research Institute –Ilonga. (ARI- Ilonga)

ARI-Ilonga has provided support in the Singida district since 2003/2004. According to the key informant views, ARI-Ilonga support sorghum farmers groups in few selected villages in the district on production and marketing of sorghum. The kind of support provided were introduction of new sorghum varieties *wahi* and *hakika* to sorghum farmers in selected villages in the district, training farmers on seed multiplication, agronomic techniques and post harvest handling techniques. ARI- Ilonga provides market information to farmers like price of sorghum prevailing in different markets.

4.6.5 Governmental organizations/institutions

The respondents were asked if there were any governmental organization that supports sorghum production in the study area. About 91.7% of respondent reported that they get support from governmental organizations and the remaining 8.3% of the respondent had no support from governmental organizations (Table 19). Table 19 shows the governmental organizations that supporting sorghum production in the study area. The study found that, one non -governmental organization was observed that supporting sorghum production in the study area.

Table 19: Governmental organizations offering services (n=60)

Governmental organizations	**Number of respondent**	**Percent**
Yes	55	91.7
No	5	8.3
Total	**60**	**100.0**
Type of organization		
District Agriculture and Livestock Department	7	6.3
PADEP	22	19.6
ARI-Ilonga	45	40.2
Mpambaa Seed Farm	27	38.3
SIDO	6	5.4
Not Applicable	5	8.3
Total	**112**	**100.0**

Total adds up to 112 due to multiple response.

4.6.5.1 Participatory Agriculture Development and Empowerment Project (PADEP)

PADEP is a programme that supports farmers to improve their crop productivity. It was established in 2004. According to the PADEP Coordinator in Singida rural district, PADEP provides support in terms of cash provided to farmers, provision of inputs, it build the capacity of target group to plan and implement development project, training farmers and build their self confidence in dealing with other actors including District staff, financial institutions, commercial organizations and NGOs. PADEP provides 50% of the cash used for improving sorghum production and marketing for 10-40 members of farmers groups.

District and Ward facilitation team conduct training on production techniques, seeds multiplications and post harvest handling to sorghum farmers. It provides inputs like sorghum seeds to farmers (*wahi* and *hakika*) and Minjingu Rock Phosphate (MRP) fertilizer, conducted farmer's field days where farmers from different villages visited other farmers for the purpose of learning. PADEP provides market information to sorghum farmers like price of sorghum, market availability, information on sorghum processing and packaging.

The challenge faced in supporting sorghum production and marketing are unreliable rainfall in the district, presence of pest and diseases to sorghum, bird problems and farmer's reluctant in formation of groups.

4.6.5.2 District Agriculture and Livestock Development Department (DALDO Office)

The study shows that, District Agriculture and Livestock Development Department as local government authority plays an important role in supporting sorghum farmers on production and marketing regulatory institutions. Extension officers also distribute sorghum seeds to farmers in the villages. Through DALDO office, farmers can access information on markets and prices. Also farmer reduces transaction cost of accessing market information's. Extension officer in collaborations with institution distribute sorghum seeds to most drought affected farmers in the selected villages for food security in the area.

Challenged faced in supporting sorghum farmers were unreliable rainfall, lack of enough funds for making follow-up after facing out of some projects, tendency of farmers to grow maize in the drought area instead of sorghum and reluctance of farmers in using agronomic techniques as trained by extension officers.

4.6.5.3 Mpambaa Seed Farm

Mpambaa Seed Farm is situated at Mtinko Division in Singida rural district**.** According to the farm manager's views, Mpambaa seed farm deals with seed production (quality declared seeds) and sell to farmers in the district. The types of seeds produced in the farm are maize, sunflower, sorghum, soya beans, coriander and yellow peas. In case of supporting sorghum farmers, Mpambaa Seed Farm plays an important role in providing improved varieties to sorghum farmers, selling the seeds at reasonable prices compared to other stockiest. Mpambaa Seed Farm produces 140 bags of sorghum seeds per season including both *pato* and *wahi* varieties. All seeds sold to sorghum farmers in the season are packaged in 1 kg packets and are sold at TZS 500.00 In this case; farmers find it easier to purchase seeds from the Mpambaa Seeds Farm.

Challenges faced by Mpambaa Seed Farm are lack of enough capital for running the enterprise and replacing the worn out machinery like tractors and lack of well established storage structures for storing the harvested seeds. This can be harnessed if the government can find a way of supporting the farm by providing loan in order to enable farmers in the district acquire seeds at the right time and at a reasonable price.

4.6.5.4 Small Industry Development Organization (SIDO)

Key informant from SIDO indicated that, Small Industry Development Organization (SIDO) in Singida region provides different support to sorghum farmer's groups. SIDO provides market information to farmers especially on sorghum prices that are prevailing in different markets, conduct trade shows to farmers whereby farmers from different wards display their crops, provides credits to farmer's groups, provides training to sorghum farmers on how to process sorghum and how to prepare different kinds of sorghum foods.

SIDO also provides advice to farmers on how to increase sorghum production and use of improved sorghum seeds and equipments. In the future SIDO-Singida has a plan of distributing 350 threshing machines to sorghum farmer's groups in Singida region. The kinds of market information provided by SIDO in the region are price of the produce and market availability. The information is obtained from different website and from trade shows. Farmers in the region are encouraged to form groups so that they can benefit from getting market information, credit and threshing machines from SIDO.

The challenges faced by SIDO on supporting sorghum production and marketing includes the use of local equipment, use of unimproved varieties and lack of motivation of forming farmers groups. Also some of farmers' groups' failed to return credits received from SIDO.

4.6.7 Non- governmental organization/institutions

4.6.7.1 Food and Agricultural Organization Emergency Project (FAO)

Food and Agricultural Organization Emergency project (FAO) as non- governmental organization in Singida Rural District stated supporting sorghum farmers in 2006. An interview with FAO key informant shows that, in collaboration with the DALDO Office, FAO project plays an important role in distribution of emergency supply of sorghum seeds to drought affected farmers in Singida district. It collects seeds supplied by FAO from district warehouses and ensures their smooth and timely distribution. The kind of sorghum seed variety distributed is MACIA of which each selected farmer received the minimum amount of 2.5 kg. Sorghum farmers received training on planting, spacing and post harvest handling before receiving seeds.

Challenges faced by the organization in supporting sorghum production are lack of enough sorghum seeds for distributing to farmers in order to cover all villages in the district, pests and diseases which affects most of the improved varieties than the local varieties.

In Summary, the study finds that, institutional arrangement is important due to its role in reducing farmers' transaction cost of searching for inputs and outputs markets and enabling people to access new market opportunities.

The institutions arrangement in the study area provides training to sorghum farmers, inputs provisions, purchase and transporting sorghum and credit provisions to few sorghum farmers' groups. This lead to reduction of transaction cost among few farmers in the study area leaving majority of farmers with high transaction cost. This is due to the fact that some of the institutions work with few farmer groups in the area**.** Improvement of institutional arrangement by linking farmers to marketer will enable farmers to form groups hence reduction of transaction cost acquired by both farmers and traders in the study area.

4.7 Sorghum supply chain structure

The supply chain is the term commonly used internationally to encompass every effort involved in producing and delivering a final product or service, from the supplier to consumers (SCC, 2005). The distribution channels vary with the source of supply and differences in sorghum outlets. The chain is characterized by well-defined roles and stages from production to consumption. The survey established the chain which starts from farmers to local consumers, farmers to village traders to local consumers and farmers to village traders to urban traders to wholesalers to retailers and finally the final consumer.

Figure 2 portray the type of actors in the chain and the interrelations between them. The mode of operation of each and every actor as depicted in Figure 2 is discussed below.

(a) Farmers

These are small holder farmers in the village who are sorghum producers. After harvest, sorghum grain is used for different purposes such as for home consumption, for seed, local brew preparation, for payment in kind, sold or retained in the household. Farmers sell their produce either to local consumers, local retailers or to the urban traders who usually visit the village at harvest time. Farmers sell their produce at their premises or transport grain to the village centre or to the open market (*mnadani*). The modes of transport used by farmers are foot, use of donkey and bicycle. Normally these transactions take place on cash and credit term basis.

(b) Village traders

These are traders in the village, typically dealing with small quantities ranging from 200 kg to 500 kg of sorghum. Village traders buy sorghum from farmers and sell it either to urban traders or urban wholesalers who visit the village during the harvest time. Also village traders store the produce and sell it when price rises. They collect the produce from farmer’s premises or farmers may deliver it to the trader’s premises, village centre or open markets.

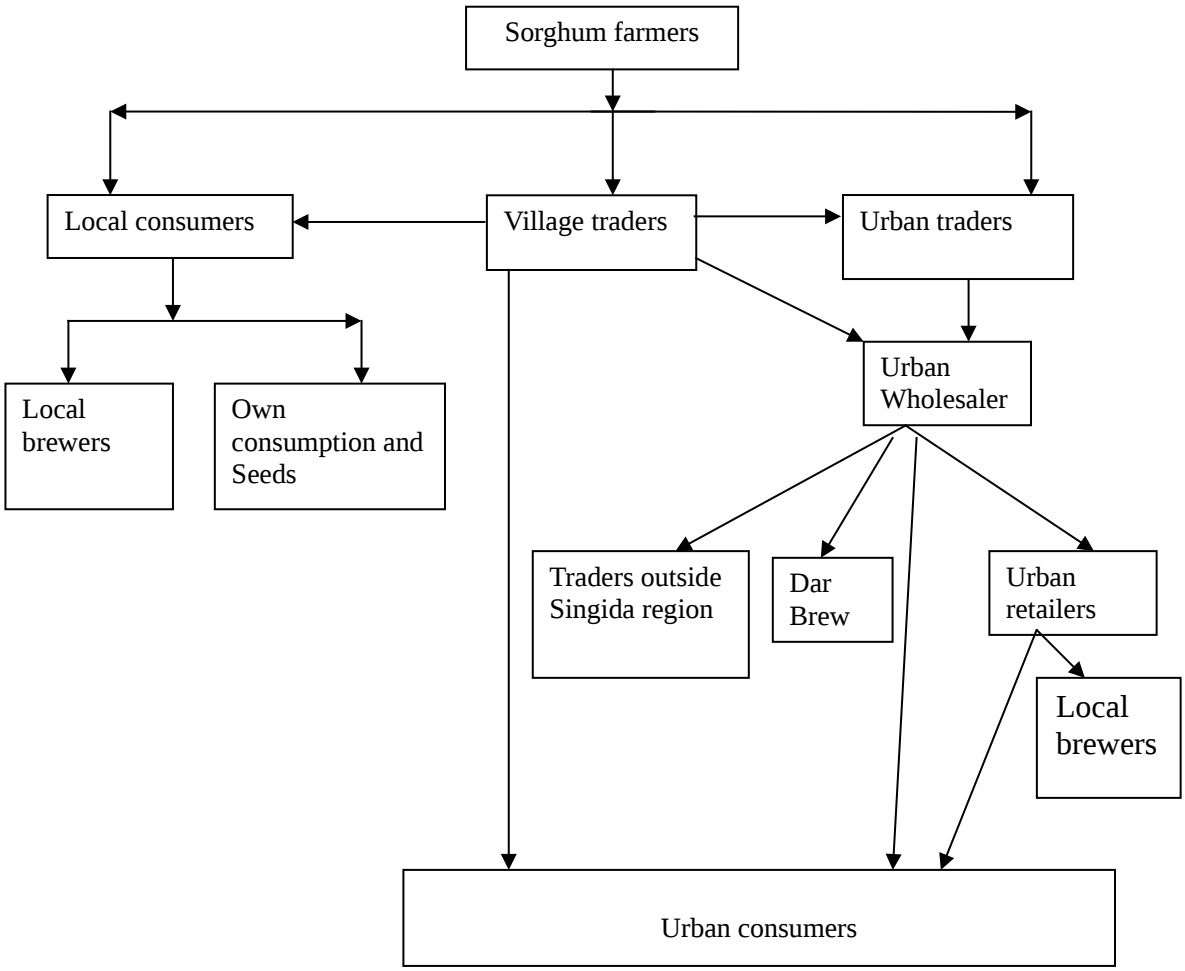

Figure 2: Supply chain of sorghum in Singida Rural District.

(c) Urban traders

Urban traders visit the village for the purpose of collecting sorghum and making an agreement with village traders during the harvest time. Urban traders sell their produce to wholesalers in the urban market. The produce is collected from the village trader's premises or at the village centers which are used by different traders for the purpose of selling their product. The mode of payment is cash bases.

(d) Urban wholesalers

Urban wholesalers deal with different type of crops such as maize, sorghum, pearl millet, sunflowers, groundnuts, finger millet, yellow peas and coriander. Wholesalers sell crops to traders outside the region, urban retailers and to urban consumers. The white sorghum variety is highly demanded by many traders especially those from outside the region but there is a problem in terms of mixed varieties (white and brown), quantity sold and quality of sorghum sold in the market. According to wholesaler's views, sorghum that reached the market is mixed with different varieties of sorghum so it is difficult to sell it to outside traders. Wholesalers do sorting of their produce by cleaning it as it reach with a lots of stones/sands.

(e) Urban retailers

Urban retailers were found in Singida town market at Ipembe area. Besides sorghum, urban retailers also sell other crops like maize, pearl millet and finger millet. The main buyers of their commodities are local brewers who normally buy sorghum from December to March; others are sorghum consumers from Singida urban and in the villages.

(f) Consumers

These are the final consumers in the supply chain. They buy sorghum from sorghum farmers, village traders and urban retailers. The produce bought is used either for household consumption, seeds or local brew preparation. Informal interview with retailers in the urban market revealed that, sorghum bought by urban consumers is used mainly for local brew preparation especially from December to March.

The flow of sorghum from producer to the final consumer is long when left to individual producers and the collection of sorghum from farmers to the market takes time hence long supply chain is experienced. For efficient supply chain it would prefer to obtain sorghum through institutional arrangement such as contract farming and bulk purchasing and also formation of farmers groups that will enable them to sell their produce in bulk in the urban market, thus compress supply chain and hence reduce transaction cost.

4.8 Transaction costs and sorghum supply chain

Transaction cost include costs resulting from distance to markets, poor infrastructure, high marketing margins, imperfect information, supervision and incentive costs (North, 1991). In this study transaction cost incurred are classified into two categories that is observable and non observable.

4.8.1 Observable transaction costs

4.8.1.1 Distance to the market place by farmers

In this study information on the distance from the farmer’s dwellings to the marketing place as well as the modes of transportation were captured as they are considered to be important aspects of transportation costs. The distance to the selling place was estimated to be 1 to 2 km from respondent premises and others who are very near to the village

centre used average of 10m to reach the selling place that is the village centers or trader's premises, so there is no transportation cost incurred by farmers. The estimated transportation cost was TZS 500 to hire ox-cart for 500- 1 000 kg of sorghum in one trip of transporting sorghum to the trader's selling place.

4.8.1.2 Distance to market place by traders

The study revealed that a mean distance used by traders from the village to the urban market is 21.22 km, transportation costs of sorghum from the village to Singida urban market was TZS 1,500 per 100 kg. During the rain season some of the village roads are difficult to pass, so traders incur an estimate TZS 2,000 per 100kg cost of transporting sorghum. Distance to the urban market 21.22km and bad roads especially during the rain season, village traders incur high cost of transporting sorghum as a result high transaction cost. These observations concur with Noth (1991), Sadoulet and de Jaury (1995) who has observed transaction costs results from the distance from markets.

Urban traders and wholesalers who used to purchase sorghum from the village usually hire cars or use buses as their mode of transport from the village to the urban markets and pay TZS 1,500 per 100kg. Table 20 indicates that 55.6 % of the interviewed traders used hired transport as their mode of transport, 33.3 % used drought animal and 11.1 % bicycles.

Table 20: Mode of transportation of sorghum to the selling point

Mode	Number	Percent
Hired transport	5	55.6
Bicycle	1	11.1
Drought animal	3	33.3
Total	**9**	**100.0**

4.8.1.3 Storage cost

In the urban market, wholesalers and retailers stored their produce at CCM building. The storage cost charged was TZS 200/= per 100 kg of sorghum per month. Handling cost incurred by retailers was TZS 200/= per 100kg in the urban market. In the rural area, village traders stored their produce in their own premises, so there is no cost associated with storage of produce in the village.

4.8.2 Non observable transaction costs

4.8.2.1 Transport sorghum to the traders selling place

Farmers transport sorghum to the village center or to the trader's premises/selling place by foot carrying their produce on head or by using their own bicycle/donkey. No direct cost incurred by farmers in transporting sorghum to the selling places. The cost is considered to be unobservable to farmers.

4.8.2.2 Time spent in searching buyers

Farmers spent one to five days in visiting village centers, open market and trader's premises in searching buyers especially when they want to sell their produce in order to solve certain family obligations. Farmers visit village trader's premises to search for sorghum buyers or ask their fellow villagers for buyers of sorghum. The time spent in searching for buyers is high so they could perform other obligations.

Also in this study the respondent were asked about the number of buyers contacted. The findings from this study shows that, about 35% of the respondent contacted three or fewer buyers in a season and 11% contacted more than three buyers. The remaining 23.3% of the respondent had no contact with buyers (Table 21). Based on the percentage obtained it shows that the higher the number of buyers contacted leads to higher transaction cost.

Table 21: Number of buyers contacted last year

Contacts	Number of respondent	Percent
One to three buyers	35	58.3
More than three buyers	11	18.3
No contact with buyers	14	23.3
Total	**60**	**100.0**

4.8.2.3 Placing order of the produce

Traders spend an average of 20 to 30 days in placing orders of the produce up to the delivery; orders of the produce are placed by the urban traders who buy produce in the village. They find traders in the village or farmers in the village who can buy the produce and distribute them to wholesalers in the urban market. Wholesalers used mobile phone to contact other traders in the village asking for the produce. The higher the number of days spent up to the delivery, the higher the transaction cost incurred in terms of valuing the time used to communicate with traders /farmers in the village, so the cost is considered as unobservable to traders.

4.8.2.4 Market contract

Market arrangement between producers and buyers has impact on transaction costs. Well enforced contract will reduce uncertainty and therefore low transaction costs. In this study the aspect of contractual arrangement was captured by asking if there was any written

contract to both farmers and traders. The study found that, all interviewed farmers and traders have no written contract. The contract considered to be informal and hence not well enforced. The means of enforcement were “trust” among trading partners, thus lack of trust among partners can be disadvantage to traders and advantage to farmers because they can sell the produce to other traders. Farmers/traders sell their produce to buyers through negotiation and the prevailing market prices. The cost incurred in terms of time spent in negotiation is considered to be unobservable to both farmers and traders.

4.9 Sorghum Marketing

A market has considerable influence on a technology input and the output market which are the key factors in production. Sorghum farmers sell their produce to their fellow farmers in the village, village centers, and open markets and to the urban market.

4.9.1 Market information acquired by respondent

Market information particularly price, is an indicator of short run demand and supply conditions in various markets. By indicating what amounts of sorghum are demanded and where, it facilitates the timely and speedy flow of sorghum from producers to consuming markets, and therefore contributes to market efficiency. The survey data revealed that market information like potential sorghum and prevailing prices among farmers was obtained from sources such as traders who always visit the village (46.7 %), friends /relatives (23.3 %), from traders, friends/ relatives and neighbors (18.3 %) and listening to the radio (8.3 %) (Table 22).

The producers were also asked about the cost incurred in acquiring information especially price information for a fee. The minority (31.7 %) of the interviewed respondents incur cost of using radio and mobile phones as a source of information while the remaining (68.3 %) did not. The radio can be very useful in dissemination of technologies and market

information (Kinabo and Abeli, 2007). However, results from this study shows that 8.3% of the respondent use radio as a source of accessing market information. The results shows that, despite the usefulness of the radio for market information, respondents from the study rarely used it probably due to their inability to buy this particular information dissemination instrument.

Table 22: Source of market information

Sources	Number of respondent	Percent
From traders	28	46.7
Friends and relatives	14	23.3
Radio and broadcasting	5	8.3
Traders and neighbours	2	3.3
Traders, neighbours, friends and relatives	11	18.3
Total	**60**	**100.0**

The strategies mentioned by the interviewed respondents to access market information regularly were, seeking information from different traders who usually visit the village (25 %), use mobile phone to ask traders (20 %), ask friends/relatives (20 %), listen to radios and ask traders(13.3 %), ask village leaders and listening to radios and no strategies (16.7 %) (Table 23). Traders mentioned phoning frequently among different wholesalers and visiting different markets among retailers as their strategies for acquiring market information.

Table 23: Strategies of accessing market information (n=60)

Strategies	N	Percent
Ask traders	15	25.0
Use o f mobile phone to ask traders	12	20.0
Listening to radios and ask traders	8	13.3
Ask village leaders and listening radio	3	5.0
Ask friends and relatives	12	20.0
No strategies	10	16.7
Total	**60**	**100.0**

4.9.2 Market problems faced by farmers

The results presented in Table 24 show that, the marketing problem faced by the interviewed respondents in the study area. About 39.6 % of the respondents reported unreliable sorghum market as a major problem, low price of sorghum (36.6 %). Other problems reported include unreliable buyers and poor infrastructure.

Table 24: Proportional of traders stating critical problem of sorghum marketing (N=60)

Market problem	Frequency	Percent
Low price of sorghum	49	36.6
Lack of reliable sorghum market	53	39.6
Unreliable buyers	28	20.9
Poor infrastructure	4	3.0
Total responses	**134**	**100.0**

4.10 Price and market margins along the sorghum supply chain

4.10.1 Prices along sorghum supply chain

The average prices of sorghum at different nodes of the chain are presented in Table 25. The average sorghum price was lowest at the farm level and highest at the retail level. At the farm level, it was expected that only cost of production were incurred whereas at trader's level, the cost of transportation to the selling point and small profit will increase the price. At the wholesales level, cost of transporting from the village to Singida urban market, storage and marketing cost increased prices. This explains why the marketing margin is higher than in the other nodes of the chain. At the retail level the storage cost and the small profit accounted for the increased price.

Assessment of sorghum price trend in the study area show that, price is always lower during June to October when the supply of sorghum in the village and the one that is

delivered to the market is high. On the other hand, the price of sorghum is higher during September to May where the quantity of sorghum delivery to the market is low. During these months, farmers already start preparing farms for the next season. The main buyers of sorghum in this period are local brewers. Traders in the village sell their produce to wholesalers or urban traders from stored sorghum that was stored from September to May. The price and quantity delivery to the local market comply with the law of demand at which, prices varying inversely with the quantity demanded in the market.

4.10.2 Marketing margin along sorghum supply chain

Market margin analysis was based on the marketing functions that were carried out at every level of the chain actors. Market margin is the difference between prices at two market levels e.g. producers and wholesalers or wholesalers and retailers. Market margin were calculated by finding the price variations at different segments and then comparing them with the final price at the consumer's level. The chain actors' incur marketing functions such as transportation cost, handling cost and storage cost and other market cost until the product gets to the final consumer. The average variable cost was obtained by summing all average total cost incurred along the supply chain. Profit margin is obtained by subtracting average variable cost from marketing margin.

Marketing margin for sorghum were estimated based on buying and selling prices. The results found to be different in terms of months that sorghum was sold. It was found that during July to October, the market margin were TZS 1 500, 2 800, 3 800 and 1 800 to village traders, urban traders, wholesalers and urban retailers respectively. On the other hand, during November to March the marketing margin were TZS 2 500, 3 000, 4 800 and 2 800 to village traders, urban traders, wholesalers and urban retailers respectively (Table 25). The higher the marketing margin reflects less income to sorghum producers

and more benefit to other supply chain actors. From the findings, it shows that wholesalers have experienced higher marketing margin and profit margin compared to other chain actors. This means that producers have received low prices of TZS 10 000 or 15 000 per 100 kg while retailers received TZS 21 000 or 30 000 per 100 kg hence benefited more in the chain actors. The results revealed that, there is high transaction cost results from high marketing margin. Also if farmers form organizations they could store sorghum in bulk and sell it when price rises. For example they could sell for TZS 22 000 per 100 kg instead of TZS 15 000 per 100 kg in the urban market.

Table 25: Sorghum price and Market margin along the chain in TZS/100 kg

Participants	Producer	Village traders	Urban traders	Wholesalers	Urban retailers
July –October					
a)Average buying price	-	10 000	12 000	15 000	19 000
b)Average selling price	10 000	12 000	15 000	19 000	21 000
c) Average variable cost		500	1 000	1 200	400
d) Market margin (b-a)		2 000	3 000	4 000	2 000
e) Profit margin (d-c)		1 500	2 000	2 800	1 600
November -March					
a) Average buying price	-	15 000	18 000	22 000	27 000
b) average selling price	15 000	18 000	22 000	27 000	30 000
c) Average variable cost		500	2 200	200	400
d) Market margin(b-a)		3 000	4 000	5 000	3 000
e) Profit margin (d-c)		2 500	1 800	4 800	2 600

Note. The average variable cost equals to summation of average transportation costs, handling cost and storage cost.

4.10.3 Correlation analysis

A correlation analysis was carried out between market margin, selling and buying of sorghum (Table 26). There was a very strong association (R=0.929, P=0.05) was observed between buying and selling prices. There was a negative correlation between marketing margin and buying price at wholesale level. This result implies that, as the buying price increases the margin decreases and vice versa. The results suggest that, at wholesale level buying price was unstable thus traders could not maintain either buying or selling prices which results from unstable market. This is attributed to Singida region market being a centre for selling sorghum in the region and also from other sources like village centers.

The insignificant association between marketing margins and selling prices implies that selling prices were relatively stable than buying prices therefore marketing margin was independent of selling prices. This revealed that prices paid by consumers of sorghum in the study were associated with the marketing costs incurred by chain actors.

Table 26: Correlations between buying and selling price and market margin of sorghum sold by traders

At July October	Market margin	Selling price	Buying price
Market margin	1.000	0.082	-.082
Selling price		1.000	0.929(*)
Buying price			1.000
At November-March			
Market margin	1.000	0.213	0.34
Selling price		1.000	0.922(*)
Buying price			1.000

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

CHAPTER FIVE

5.0 CONCLUSION AND POLICY IMPLICATIONS

The general objective of the study was to assess the role of institutions in supporting sorghum production and marketing and the transaction costs incurred in sorghum supply chain in Singida Rural district. The specific objective were to identify types and role of institutions that are influencing sorghum production and marketing in the study area, to examine the transaction cost incurred along the chain actors, to determine the price and market margin along the supply chain actor, to investigate the constraints faced by identified institutions in supporting sorghum supply chain in the study area and finally to suggest remedial intervention strategies to improve sorghum production and marketing in the study area. This chapter presents conclusions and policy implications emanating from the major findings of the study.

5.1 Conclusion

The main results of this finding shows that , the institutions identified in the study that play an important role in supporting sorghum production were farmer organizations, traders, governmental organizations like PADEP, Mpambaa Seed Farm SIDO-Singida, DALDO Office, research institutes ARI-Ilonga, and private sector. These institutions provide market information to farmers; price information's, training to sorghum farmers and inputs. The study reveled that, this lead to reduction of transaction cost among few farmers in the study area leaving majority of farmers with high transaction cost. This is due to the fact that some of the institutions work with few farmer groups in the area. Improvement of institutional arrangement by linking farmers to marketer will enable farmers to form groups hence reduction of transaction cost acquired by both farmers and traders.

Observable and non observable cost transaction costs incurred along the chain actors were identified. High transaction cost was observed as a results of distance to market place incurred by farmers and traders and storage cost along the chain actors. Unobservable cost identified includes time spent in searching buyers, cost associated with placing order of the produce and market contract.

Market performance was first done by determining the market margins at different segments of the markets. The market margins were calculated by finding the price variations at different segments and then compared with the final price of the consumers' level. Consumer price was the base for all market margins.

Based on the selling and buying prices, the high market margins was realized at wholesale level compared to the other chain actors. There was a negative correlation between buying prices and market margin which results to unstable market. This reflects less income to sorghum producers and more benefit to the other market actors.

Challenges identified in the study were low price of sorghum produced at the farmer's level compared to the wholesaler and retailer's level, lack of threshing machines, bird problems, lack of reliable sorghum market and limited access to market information.

5.2 Policy implications

The following implications are suggested towards improvement of sorghum production and marketing in semi arid area like Singida rural district.

5.2.1 Farmers/traders association

i. Forming an association enables farmers/traders to acquire different training, produce in large quantity and traders selling the produce in bulk, also it enables collective bargaining and increase negotiation power for farmers and traders. Farmers/traders should form an associations that will enable them to access market information's easily hence reduce transactions cost and enjoys the economies of scale.

ii. Contractual arrangement is important in the in the study area this can be achieved through institutional arrangement where by farmer's contract with other partners in order to sell output in bulk and purchase inputs hence increase sorghum production and marketing. Therefore it is important for the government to take the role of enforcing contract between buyers and sellers by mediating the dispute between them. This will significantly contribute towards contract farming and more participation of many sorghum farmers in contract farming.

iii. Linking sorghum farmers to marketers will enable them to shorten supply chain and reduction of transaction cost to both farmers and buyers. The direct link to institution will enable farmers to produce quality sorghum at large quantity. This could be achieved by institutions that supporting sorghum production and marketing in the area.

5.2.2 Policy implications

5.2.2.1 Establishment of threshing, dehulling and milling sorghum machines

In order to overcome problem of threshing sorghum on the ground and selling sorghum with a lot of sands and stones, policy makers and others stakeholders should ensure sorghum are full exploited. This can be achieved by encouraging small industries and

other stakeholders to produce a threshing, dehuling and milling machines that will be distributed to sorghum farmers. The availability of threshing machine will increase sorghum production and marketing in the area.

5.2.2.2 Improvement of availability and accessibility of market information

Lack of market information was one of the factors affecting marketing of sorghum. Provision of timely and adequate market information, for example on sorghum prices, is key for the producers to react appropriately to market signals and forces. Various ways of improving the flow of information need to be developed with the private sector by encouraging farmers and traders association to play a major role. Also there is a need to establish market information network and encouraging different actors within the sorghum supply chain to exploit fully the potential of modern information technology available in the district. One way of achieving this is to ensure that farmers and traders actors have access to mass media such as cell phones, radio, television and internet.

5.2.4 Suggestion for further research

The future research is recommended to be adding value to sorghum. These will widen the knowledge of farmers on sorghum processing and enable them to increase sorghum production and marketing.

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APPENDICES

Appendix 1: Estimates of sorghum requirement by major sorghum buyers in Tanzania.

Organizations	Requirement (t) per year
Dar brew	800
Power Foods	300
Fida Hussein (Export)	>1,000
Animal Feed	300
Nyire family ltd	300
SGR up to 16 October 2006b	1900

Source (Mbwaga, 2006)

Appendix 2: Farmers questionnaire

Questionnaire No…….Date of interview……

Interviewer's name…….

Name of respondents……..

Ward…….Village……..

A. FARMERS CHARACTERISTIC

1. Age of the household……..

2. Gender of the respondent

1. Male 2. Female

3. Marital status

1. Married 2.Single 3. Widowed 4. Divorced 5.Other specifies.

4. Education level of the respondent

1. No formal education 2. Primary Education 3. Secondary Education

4. Post education

5. Main source of Income

1. Sales of food and cash crops

2. Sales of livestock and its product

3. Sales of local brews

4. Others (specify)……

B: SORGHUM PRODUCTION

6. Do you cultivate any sorghum on your farm?

1. Yes 2. No

7. When did you started cultivating sorghum

…….

8. Which variety of sorghum that you are currently growing?

1……..2……..3……..4……..

9. Have you ever grown improved sorghum variety?

1. Yes 2. No

10. If yes, please name them

…….

11. Please fill the table below which show the source and year started cultivate sorghum variety

Variety	Year started cultivating	Source of seed	Current use 1. Still in use 2. Discontinued	Reasons for discontinue

12. Name any of the sorghum variety you prefer most

1……2……..3…….

13. Please give reasons for your preference?

Sorghum type	Reasons
1……..	……
2…….	……
3…….	……

14. What is the main reason (s) for undertaking sorghum production (Give explanations?)

a)……..

b)……..

c)……..

d)……..

15. What is the total area under sorghum production for last season?

……..

16. What is the average sorghum production in last season?

……..

17. What is your future plans concerning the total area under improved varieties?

1. Increase 2. Reduce 3. No change 4. About to start

Please give reasons…….

……

18. What kind of inputs that you use in sorghum production?

1……2……..3…….

19. From where do you get those inputs?

……

20. Do you get any support during production?

1. Yes 2. No

21. If Yes, What kind of support do you get?

……

…….

C. SORGHUM MARKETING.

22. What are the uses of sorghum in your last seasons?

1…….
2…….
3……..
4…….

23. Give the estimate of the sorghum sold in the last season?

…….

24. Where did you sell your sorghum?

A. In the village
B. Outside the village
C. Urban market
D. Others specify…….

25. What are the estimates of quantity of sorghum sold in 23 above last season?

…….
……

26. To whom did you sell your sorghum?

1. Traders within the village.
2. Traders outside the village
3. Neighbours
4. Others specify……..

27. How much do you sell to the 26 above the last season?

……
…….

28. Give reason why you decide to sell your sorghum in the place you mention above

……..

……..

29. Please fill the following table to indicate price of your produce that you sell in different markets.

Type of market	Quantity sold	Price of each quantity

30. Are you satisfied with the prices above?

1. Yes 2. No

31. If no why……

32. Where do you normally contact buyers?

1. At your home 2. At the village centre 3. At the buyer collection centre

4. Others specify…….

33. How many buyers did you contact to offer the product in the last year?.....

34. Do you trust buyers/collectors who buying most of your products?

1. Yes 2. No

35. What is the condition for sale?

1. Cash 2. On credit 3. Others (specify)……

B. Market information.

36. Where do you get market information?

1. From traders
2. From neighbours
3. From friends and relatives
4. Radio and broadcasting
5. Internet
6. Others specify……

37. How do you get this information?

1. By physical visit
2. By asking traders who come to buy
3. By listening to radio and watching television
4. By reading magazine
5. By use of fixed telephone
6. By use of mobile phone
7. Others specify……

38. What type of market information do you get?

1. Price of the produce
2. Price of input
3. Quality and standards of the produce
4. Others specify……

39. Do you incur any cost in acquiring that information?

1. Yes
2. No

40. If Yes, how much (Tshs)

……

……

41. What strategies do you set to receive market information regularly?

……..

…….

42. What problems do you face in the marketing of sorghum?

…….

……

D. SORGHUM PROCESSING

43. Do you process your sorghum after harvesting?

1. Yes 2. No

44. If No Why……

45. Do you get training on sorghum processing?

1. Yes…….2. No…….

46. If yes how did you learned?

1. Learn by doing.
2. Learn from family members/friends
3. Learn from other practitioners
4. Formal training.
5. Others (specify)……..

47. What kind of equipment that you use to process your produce?

……

48. What is your opinion concerning sorghum processing?

…….

…….

…….

E. SORGHUM CONSUMPTION.

49. What is the most important food for your family?

…….

50. How often does your family consume sorghum meals?

1. Very often 2. Occasional 3. During hunger periods 4. Never consumed

51. For the past two weeks, what has been the frequency of consuming the following foods?

Rice……times

Sorghum ugali……times

Sorghum porridge……...times

Peal millet ugali……..times

Peal millet porridge……times

Maize ugali…….times

Maize porridge……times

52. Apart from Ugali, porridge and local brew, what else have you ever-use flour sorghum?

1……
2……
3……
4……

F. PRODUCER ASSOCIATION, CREDIT AVAILABILITY AND INSTITUTIONAL SUPPORT.

53. Is there any group or farmers associations concerning sorghum production in this village?

1. Yes 2. No

54. If yes are you a member?

1. Yes 2.No

55. If yes mention it……

56. What are the benefits of being a member?

1. Easy to market produce 2. Easy to negotiate for better price

3. Easy to acquire inputs 4. Others (Specify)……..

57. What prevent you from joining an associations/group?

1. Few farmers growing sorghum

2. No knowledge on formation of an association

3. Others (specify)……

58. Did you take any credit for sorghum production?

1. Yes 2. No

59. If yes, what was the source of credit that you received (indicate the credit institution(s)

1…….
2…….
3…….
4…….

60. In which form was the credit you received?

1. Cash money

2. Machinery

3. Equipments/utensils

4. Other inputs

5. Others (specify)……

61. If no, what were the reasons for not having or applying for credit

…….

62. In your opinion do you think that credit is helpful?

1. Yes 2. No

63. Is there any Governmental organization that is currently offering you services on sorghum production in this area?

1. Yes 2. No

64. If yes, what are they?

1…….
2…….
3…….
4…….

65. What specific kind of services /assistance that they provide?

1……
2……
3……
4……

66. Is there any non governmental organization that is currently offering you services on sorghum production in this area?

1. Yes 2. No

15 If yes, what are they?

1…….
2…….
3…….
4…….

67. What is specific kind of services /assistance that they provide?

1……
2……
3……

Thank you for your co operations

Appendix 3: Questionnaire for sorghum traders in Singida rural district

Questionnaire No……. Date of interview……..

A. Background

1. Name of the respondent…….
2. Sex……..
3. Age…….
4. Position in the business……..
5. District…….....
6. Region……
7. Period in Business……..

B. Information on Sorghum Procurement

8. For how long (number of years) have you been involved in sorghum trading?

……

9. Have you being doing other business before? 1. Yes 2. No

10. If yes, what kind of business?

Type of business	No. of years	Revenue	Reasons for change

11. Apart from sorghum business, do you have any other business? 1. Yes 2. No

12. If yes, what kind of business do you have?

1…….

2…….

13. What kind of sorghum varieties are you dealing with?

Sorghum varieties	Business level		
	Retail	Wholesale	Middlemen

14. What are the sources of your sorghum and their respective prices last season?

Name of Sorghum variety	Source	Buying price	Selling price

15. From where do you expect to buy your produce during the next season?

Name of sorghum variety	Source

16. Do you have contractual arrangements with suppliers?

    1. Yes 2. No……..

17. If yes, what are the terms of the contract?

    1. Quality of sorghum supply

    2. Mode of payment

    3. Date of payment.

    4. Time of supply

    5. Price of sorghum supplied.

18. Is the contract legal?

……

C. Sorghum Marketing

19. Where do you sell sorghum

Place	Quantity sold

20. To whom do you sell your sorghum?

Place	Quantity sold
1. Consumers	
2. Wholesalers	
3. Processors	
4. Institutions	

21. What purposes for selling sorghum to the one mentioned above?

……

……

……..

22. Do you grade your products prior to buying or selling? 1. Yes 2. No

23. If yes, please fill the following table

Sorghum variety	Grade name	Grade characteristics	Price per grade

24. What factors do you consider important when buying or selling your sorghum?

1……..

2…….

3…….

25. What is the distance from buying to selling point (km)?

……

…….

26. What is the mode of transportation to the selling point?

1. On foot
2. Drought animals
3. Bicycle
4. Public vehicle
5. Hired transport
6. Others (specify)……

26. What are the costs that you incur during transportation process?

……

27. What number of days spends in placing orders of the product up to the delivery?

……..

28. What are the major sorghum marketing problems?

    1. Low price
    2. Unreliable market
    3. High marketing cost
    4. Lack of market information.
    5. Others (specify)……

30. What is your future prospect regarding sorghum marketing?

    …….

    ……..

    ……..

    …….

Thank you for your co operations

Appendix 4: Checklist for institutions that supporting sorghum production in Singida rural district.

1. Name of institutions…….
2. Village/street…….
3. Ward……..
4. District……
5. Region…….
6. Age of the institution (since it was started)……
7. When do you start supporting sorghum production in this area……..
8. What kind of support do you offer to sorghum producers in this area?
   1……
   2. ……...
   3. …….....
9. Do you provide input to sorghum farmers?
10. What kind of input do you provide to them?
11. Estimate the cost used in provision of those input.
12. What advice do you give to farmers before you provide input to them?
13. Do you provide market information to the sorghum producers
    1. Yes
    2. No
14. What kind of market information do you provide?
15. Do you have any contract to farmers concerning sorghum production?
16. If yes, what are they?

17. What are your role played in supporting sorghum production and marketing in the area?
18. What are the challenges faced during supporting sorghum production and marketing in the study area?
19. What do you suggest to be done to harness the situation?

Thank you for your co operations

Appendix 5: Characteristic of the improved varieties introduced in Singida Rural District

WAHI(P9406)	**HAKIKA(P9405)**	**PATO**	**MACIA**
Good drought tolerance	Good drought tolerance	Good drought tolerance	Drought tolerance
Striga tolerance	High degree of tolerance to Striga even at low nitrogen availability.	Low degree of tolerance to striga	Low degree of tolerance to striga
It mature after 100 days	It mature after 107 days	It mature after 120 days	It mature after 100-110days
Yield with striga 2.0 - 2.5 tones per ha	Yield with striga 1.0 - 2.0 tones per ha	Yield with striga 0.5-1.5 tones per ha	Yield with striga 0.1-1.0 tones per ha
Total yield without striga 2.5 -3.0 tones per hector	Total yield without striga tolerance 1.5-2.5 tones per ha	Total yield without striga tolerance 1.5-2.0 tones per ha	Total yield without striga tolerance 1.0-1.5 tones per ha
Have good grain quality and taste	Have good grain quality and taste	Have low grain quality and taste	Have good grain quality and taste

Source: ARI-ILonga Research Institute leaflets (2005).

WAHI-“early” i.e. to indicate the early maturity of this material

HAKIKA-“be sure”i.e the farmer is sure of harvest something even from the striga infested fields

Appendix 6: Role of Institutions/Organization in sorghum production and marketing

Item	Organization/institutions involved
Extension services, policy regulator	DALDO OFFICE
Distribution of improved sorghum seeds to sorghum farmers groups, funding sorghum production to sorghum farmers groups, training farmers groups on sorghum production and post harvest handling and training on group formations.	PADEP
Provide improved sorghum seeds to farmers in the village.	MPAMBAA SEED FARM
Provision of improved sorghum varieties to farmer groups, train farmers groups on how to produce quality declared sorghum seeds.	ARI-ILONGA,
Buyers of sorghum from farmers in the village.	Sorghum village and urban traders
Provision of credit to sorghum farmers groups.	SIDO, SACCOS
Market information, price information and selling sorghum in collective at reasonable prices.	Sorghum farmers groups

Source: Own survey, 2007.