MARKET EFFICIENCY ANALYSIS OF JATROPHA VALUE CHAIN: CASE STUDY OF MONDULI AND ARUMERU DISTRICTS

BY

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A DISSERTATION SUBMITTED IN PARTIAL FULLFILLMENT OF THE REQUIREMENT FOR THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS OF THE SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

2011

ABSTRACT

This study was undertaken to assess the market efficiency of Jatropha value chain by assessing the Jatropha market channels, pricing efficiency, profitability and price transmissions. The data were collected from a sample of 130 Jatropha market chain actors who were randomly selected from Monduli and Arumeru Districts using a structured questionnaire. Concentration indices were estimated to assess the market power. Market margin was used to estimate the differences between the selling and buying prices while gross margin was estimated to assess the income earned per each value chain actor. Pricing efficiency analysis was used to assess market efficiency at different nodes of the market chain while the average market shares were used to estimate the proportion of producers' prices against the ultimate consumption and utilization level. The results showed the market structure of the Jatropha farmers is unconcentrated and that of Jatropha traders is non-competitive with concentration indices of 18% and 36% respectively. Results of profitability analysis indicated variation in gross margins with the highest margin (1 363 610Tshs/kg) obtained by processors while farmers' market margin was the lowest (84Tshs/kg). Selling and buying prices at farmers' level were highly correlated with each other($r = 0.713$; $p = 0.01$). At the traders' level, results indicate a strong correlation between the selling price and market margin ($r = 0.941$; $p= 0.01$). The average market shares results indicated farmers received 35%, while traders and processors received percentage shares of 21% and 43% respectively. In conclusion, the Jatropha marketing system is not efficient in Tanzania. Therefore, the study recommends that interventions to encourage Jatropha production and productivity in the country should be done and pricing behaviours and market information systems should be strengthened.

DECLARATION

I, Pendo-Edna Mahoo, do hereby declare to the Senate of Sokoine University of Agriculture that this research dissertation is the result of my own original work and that it has neither been submitted nor being concurrently submitted for degree award in any other institution.

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The above declaration is confirmed

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ACKNOWLEDGEMENTS

First and foremost I would like to thank my GOD the almighty for making my studies and my academic years at Sokoine University of Agriculture (SUA) possible. Several people provided support to me during the two years of my study at SUA and it is hard to mention them all lest I forget some. Therefore, I would like to register a general thank to all for the support. However, the following people and institutions deserve a special mention.

My sincere thanks should go to my supervisors Dr. Khamaldin Mutabazi of Sokoine University of Agriculture and Mr. Justus Von Geibler of Wuppertal Institute Germany for their tireless efforts and constructive comments during the preparation of this dissertation. I feel privileged to have the opportunity to work under them.

I also convey my heartfelt thanks to the Biofuel Evaluation for Technological Tanzanian Efficiency using Renewable-integrated Strategies (BETTER-iS) project and the World Agro-forestry Centre (ICRAF) for funding the research work and all the costs in the production of this dissertation. I would also like to acknowledge the contribution of all my respondents from Monduli and Arumeru Districts. Thank you so much for sharing with me your experience on Jatropha. Special thanks should go to the following people: Zobida, Moses, Ernest, Bruno, Paul and Maria who helped me during the time of data collection in the field. The driver Mr. Hamad Salum did a wonderful job during the fieldwork.

I owe much gratitude to my parents Henry and Nadhael Mahoo, my brother Fatael, my two sisters Irene and Monica and my best friend Tulamwona Dumulinyi for their love, prayers, support and encouragement. Words cannot express how grateful iam. Last but not least, I would like to acknowledge the support of my fellow students of MSc Agricultural Economics (2009/2011). Thank you for your friendship.

DEDICATION

This work is dedicated to my beloved parents, Prof. Henry Fatael Mahoo and Mrs. Nadhael Henry Mahoo who laid the foundation for my education. I love you so much and God bless you.

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LIST OF ABBREVIATIONS AND SYMBOLS

%	Percentage
<	Less than
>	Greater than
APT	Asymmetric Price Transmission
ARI-MONDULI	Alternative Resources Income project for Monduli women
C°	Degree Centigrade
e.g.	For example
Eqn	Equation
FAO	Food and Agriculture Organization of the United Nations
GM	Gross Margin Analysis
GTZ	Gemeinschaft für Technische Zusammenarbeit (German Technical Cooperation)
Ha	Hectare
JCL	Jatropha Curcas Linnaceus
JPTL	Jatropha Products Tanzania Ltd
KAKUTE	Kampuni ya Kusambaza Teknolojia
KAMA	KAMA Herbal Product Limited
Kg	Kilogram
LARRI	Land Rights Research and Resource Institute
MCBA	Market Channel Baseline Analysis
MEM	Ministry of Energy and Minerals
MMA	Match Makers Associates

n	Number
OLIT	OXFAM Livelihood Initiative for Tanzania
p	Probability
SNAL	Sokoine National of Agricultural Library
SPSS	Statistical Package for Social Science
SVO's	Straight Vegetable Oils
TaTEDO	Tanzania Traditional Energy and Environmental Development Organization
Tshs	Tanzanian shillings

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

The global energy supply is currently mainly based on fossil fuels, which have many disadvantages including global warming and pollution. It is now widely agreed that more sustainable alternative energy sources will need to be developed. One potentially promising option is biofuels, since these are derived from biomass, have a closed carbon cycle and do not contribute to the greenhouse effect (Eijck and Romijn, 2008).

Biofuel refers to renewable energy produced from biomass, such as organic materials like plants, fruits or seeds (Alain *et al*., 2011). It can also be referred to as fuels derived from biological sources (Von Lampe, 2006). Biofuels come in various forms and the biomass necessary for the production of biofuels can be derived from several sources. However, oil-producing crops are prominent. The use of biofuels has long been promoted as a feasible substitute for conventional fossil petrol and diesel fuels. Historical records indicate that the inventor of the diesel engine, used biofuel in the form of vegetable oil in his engine as early as 1900 (Prakash,1998; Shumaker *et al.*, 2003; CRFA, 2006).

A number of plant species have been considered as dedicated energy crops (Lewandowski *et al*., 2003; Walsh *et al*., 2003; Angelini *et al*., 2005). These plants represent both annual and perennial herbaceous crops and short rotation trees.

Jatropha Curcas Linnaeus (JCL) is among them. Other crops include palm trees, maize, and sugarcane. Apart from well adaptation to semi-arid conditions and often used for soil erosion, *Jatropha curcas linnaeus* species have been reported to have wide commercial applications such as oil and fuel production used for electricity (Gubitz *et al*., 1999).

Jatropha or physic nut is a shrub or a small tree belonging to the genus *Euphorbiaceae*. The plant is drought resistant and easy to establish. It can live up to 50 years and can produce seeds up to three times per annum (Chachage, 2003). Experts have found that production of Jatropha seeds involves less necessary working steps and investments. This provides more applications to rural households compared to sugar/starchy crops which incorporate a number of production activities. Jatropha seeds are widely used in oil and fuel production (Eijck and Romijn, 2008). The plant is widely seen to have potential to help combat the greenhouse effect, stop soil erosion, create additional income for rural poor and provide a major source of energy both locally and internationally (Eijck, 2006).

1.2 Uses of Jatropha

Jatropha has multiple uses. It can be used as a hedge and for erosion control, produce oil and fuel, produce soap and medicines and press cake is used as organic fertilizer and combustible. These are briefly discussed in the following sub-sections.

1.2.1 Jatropha planted as hedge

Traditionally Jatropha has been used as a hedge and markers for graves. Jatropha is widely cultivated as a living fence around settlements and fields (Plate 1). Cattle do not browse the plant and it can easily be propagated by cuttings, hence densely planted for this purpose (Robinson and Beckerlegge, 2008).

Plate 1: Jatropha trees used as hedge around the farm in Engaruka village

1.2.2 Jatropha for oil and fuel production

The most interesting uses of Jatropha lie in oil production when the seeds are pressed and the oil is extracted. The common oils and fuels from Jatropha include Straight Vegetable Oils (SVO) and biodiesel. The use of Jatropha oil as a fuel is high especially where many people have seen its an extraordinary potential. First, because of the limitation of the world's fossil fuel resources and secondly, because the use of Jatropha biodiesel is CO_2-neutral and therefore does not enhance global warming like fossil diesel. In rural households, lamps that use Jatropha oil for lighting have been developed and are being used (Amani, 2006). In addition stoves have been introduced on a large scale (Henning, 1998).The big potential market however, is in fuel for combustion engines. Jatropha oil can be used in diesel engines if its high viscosity is reduced. This can be done in three ways: preheating, mixing with other fuels and conversion to biodiesel.

1.2.3 Soaps and medicinal purpose

Many parts of the Jatropha plant are used in traditional medicine. The seeds are pressed and the oil is used to produce medicinal soap for local markets. The oil has a strong purgative action and it is also used to treat skin diseases and to soothe pain such as that caused by rheumatism. A decoction of leaves is used against cough and as an antiseptic.

1.2.4 Press cake as organic fertilizer and combustible

Contrary to many sources, Jatropha is not a nitrogen-fixing plant. The press cake however, is saturated with nitrogen-fixing compounds thus making it a good organic fertilizer. The press cake has nitrogen content similar to chicken manure and richer than cow dung.

1.2.5 Other uses of Jatropha

Because of its drought resistance, Jatropha can play a role in combating desertification and in soil erosion control. In a few places in western Tanzania, it is used as a support plant for vanilla and also provides a better ground for potatoes production (Plate 2 and 3). Jatropha wood can also be used as a burning material but is of poor quality because it is very light (density is below 0.35 t/m^3).However, the fruit hulls, seed shells and press cake can be used as a burning material (Robinson and Beckerlegge, 2008).

1.3 Problem Statement and Justification

The rush towards biofuel production among foreign investors in Tanzania has created serious problems for the Government to coordinate and guide such production. In many countries including Tanzania, investors are on the ground without the existence

Plate 2: Jatropha trees intercropped with vanilla JPTL, Arusha

Plate 3: Jatropha trees intercropped with potatoes JPTL, Arusha.

of policies and guidelines for such production as well as the marketing for such products. In Tanzania, Jatropha small-scale farmers could benefit because of the new agricultural markets by integrating them into biofuel value chains either for local or international markets (Janssen, 2006; Hazel *et al*., 2007).

Despite the positive impact made from Jatropha production as an alternative source of energy and income generation for rural poor (Heller, 1996; Eijck and Romijn, 2008), the marketing chain for Jatropha is still operating poorly. Among the constraints contributing to this include: i) low technology for processing seeds into oil which causes the market for Jatropha oil to be very small at the moment and cause the biodiesel produced from Jatropha seeds on a larger scale to be a dream of the future, ii) there is also very limited experience with large scale marketing of biofuels derived from Jatropha to date (Lyewe, 2008; GEXSI, 2007), iii) financial problems also prevail, for example; there are very few commercial financial institutions for small scale biofuel producers to obtain credits, to facilitate the

marketing activities. Other problems include poor infrastructure (such as roads). High transaction costs would also cause the marketing chain of Jatropha to operate poorly; this will deny smallholders the potential market benefits in the Jatropha subsector.

Some studies have been conducted on Jatropha in Tanzania (Chachage, 2003; Lyewe, 2008; Eijck, 2006; Loos, 2009). However, most of these studies were limited to Jatropha production and technical efficiency, farm size, prospects for Jatropha biofuel `and socio-economic impact of Jatropha on Tanzania smallholder farmers. None has provided any systematic or adequate information on the existing Jatropha marketing chain, its efficiency and marketing characteristics.

Based on the afore-said, there is a need of addressing the existing knowledge gaps, especially on how the existing Jatropha markets in Tanzania perform, what factors lead to inefficiency in Jatropha marketing and how they can be reduced. Therefore, this study was carried out in order to contribute towards these knowledge gaps in order to provide basis for formulating Jatropha marketing policies which will stimulate efficient marketing systems for Jatropha on a large scale.

1.4 Objectives

1.4.1 General objective

The overall objective of this study was to assess the market efficiency of Jatropha value chain in Monduli and Arumeru Districts in Northern Tanzania.

1.4.2 Specific objectives

1. To assess the Jatropha marketing channels and the marketing power among the actors.
2. To determine the pricing efficiency of the Jatropha marketing chain.
3. To analyse the market margins and gross margins of the Jatropha farmers, traders and processors.
4. To analyse the price transmissions from the producer to ultimate consumption and utilization.

1.5 Hypotheses

The study is guided by the following research hypotheses

1. The organizational and distribution relationships among Jatropha market actors along the value chain are not a single market channel.
2. The price variation in one market is not associated with other market.
3. Farmers receive the lowest market margins and gross margins compared to traders and processors.

1.6 Research Questions

1. What is the relationship between concentration and market power?
2. How efficient is the market chain in terms of pricing and margins received by different actors?
3. What are the prevailing prices, market margins and gross margins for different actors along the chain?
4. How quickly are farm prices transmitted to the consumer level and vice versa?

1.7 Conceptual Framework

The conceptual framework is shown in Fig. 1. Several components were considered in the analysis of Jatropha market efficiency. The first component was the pricing efficiency and followed by the operational efficiency. The Jatropha pricing efficiency was examined in terms of variables such as prices and margins. Other factors included how the Jatropha produces were differentiated from one actor to another and the competition that exists in the market and the market barriers.

The higher the correlation of prices between pairs of markets for a particular product, the better integrated the markets are for that crop and hence the more efficient they are operating in terms of price. Operational efficiency was analyzed by calculating the margins after the costs incurred during the marketing activities. The higher the market margins the more efficient the market operation. Another aspect examined was the market chain and information transparency in order to trace the movement of Jatropha from the point of production to the point of consumption and utilization by determining the concentration index and market barriers.

The relationship among these factors was based on the fact that structural characteristics tend to influence behavioural characteristics of the market participants. This implies that their number and shares can influence pricing aspects. Barriers to entry can also reduce potential entrants in the market and hence increase the bigger shares to few participants which in turn increase their market power and eventually affect the performance as well as efficiency of a competitive market.

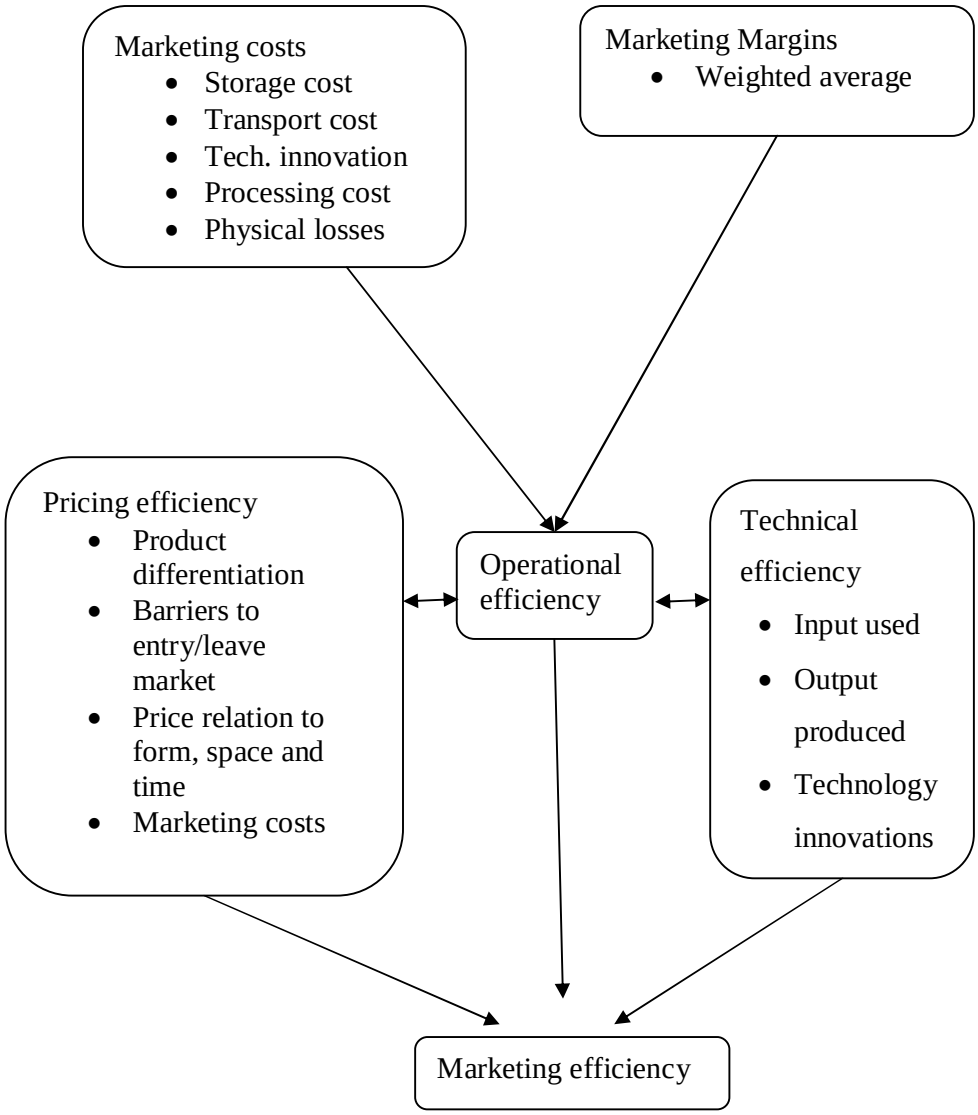

Figure 1: Conceptual framework for Jatropha market efficiency

The market efficiency would induce high prices paid to farmers which encourage high productivity and production and overall output. Farmers' and traders' profit will increase due to reduced operational costs and minimized market losses induced by improved market efficiency and structures. Better marketing structures and competition reduce prices and encourage an increase in marketable Jatropha products and hence increase consumers' savings. Finally, Jatropha market will be efficient with tangible benefits to market actors including consumers.

1.8 Organization of the Dissertation

The dissertation is organized into five chapters. Chapter one covers the introduction which includes the problem statement and justification and objectives. Chapter two presents the literature review, while chapter three provides the conceptual framework, methodology and analytical tools employed in the study. Chapter four presents the major findings and discussion of the results. The conclusions and recommendations are presented in the chapter five.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Definition of Terms and Concepts

2.1.1 Marketing

Marketing is a process that involves planning and executing ideas from production, pricing, meeting people (customers) through distribution, and promotion of ideas, goods and services to create and maintain exchange that satisfy individuals, organization and meet societal objectives in the systematic situation of global environment (Czinkota *et al.*, 1997). According to (Kotler, 2008) marketing is also defined as an activity, set of institutions, and processes of creating, communicating, delivering, and exchanging goods and services that have value for customers, clients, partners, and society at large. It generates the strategy that underlies sales techniques, business communication, and business developments; therefore, it is an integrated process through which companies build strong customer relationships and create value for their customers and for themselves.

2.1.2 Agricultural marketing

Agricultural marketing refers to all activities essentially associated with agricultural production and with food, feed and fibers assembly, processing and distribution to the final consumers. It also includes analysis of consumer's needs, motivation, purchasing and consumption behaviour (Ashimogo, 1994).

Besides the physical facilitating function of transferring the goods from producers to consumers, marketing systems also perform the functions of identifying the prices at different stages of marketing and send back price signals in the marketing chain (Ebbeden, 2004). Therefore the issues and concerns in marketing relate mainly to the efficiency of the marketing system which depends on the structure and conduct of the market (Acharya, 2006). An efficient marketing system helps in the optimization of resource use, output management, increase in farmer's income, widening the market, growth of agro-based industry and addition to national employment creation (Coulter and Onumah, 2001).

2.1.3 Market chain, value chain and supply chain analysis

i) Market chain analysis

According to FAO (2005), market chain is defined as a process of following a product from production to consumer, by looking at all points of the chain, prices in and out of each point, functions performed by each point, market demand and supply (trends), market constraints and analyzing the market opportunities for the particular product. Harahap (2003), also defined market chain analysis as a way of gaining insight into the (1) operations of specific market channels while focusing on their growth potential, (2) activities and efficiency of actors along the chain, (3) business support services involved, and (4) policy and regulatory frameworks. Using the information from the analysis, opportunities and constraints can be identified within specific market chains, and ways can be seen to improve a defined client's capacity to compete more effectively.

Lundy *et al*. (2004) clearly stated that a market chain is used to describe the numerous links that connect all the actors and transactions involved in the movement of agricultural goods from the farm to the consumer. It means agricultural goods and products flow up the chain and money flows down the chain.

ii) Value chain analysis

A similar terminology to market chain is value chain. The term value chain has been used for more than twenty years. It refers to a full range of activities needed to bring a product or a service from conception, through production and delivery to final consumers.

Value chain is defined differently by different authors. Kaplinsky and Morris (2000) defined value chain as "a full range of activities which are required to bring products and services from conception, through different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to the final disposal after use". A value chain can be viewed as the way in which a firm develops competitive advantages and creates shareholder value. It can also demonstrate the interrelationships and dynamics between individual businesses. A narrow economic-based definition of value chains involves identifying the critical value-generating activities performed by an organization. A broader system approach looks at the activities implemented by various actors, from primary producers, harvesters, processors, traders, service providers, and upstream suppliers to the downstream customers.

Value chain analyses encompass issues such as organizational, coordination, power relationship between actors, linkages, and governance aspects. The value chain approach has been a very useful analytical tool for taking a more objective look at an organization's position in a market. It allows for examining the consequence of empowering one group (for example the producer) and identifying how to link them to importers and consumers. It enables analysis of the implications of who does what, at which stage in the chain, and what this means for risk, capital needed and margins. It can help to identify with whom to form partnership in the chain (Ingram, 2009).

iii) Supply chain analysis

Supply chain analysis refers to the overall group of economic agents or a physical person (such as a farmer, trader or consumer) as well as legal entities (such as business, an authority or a development organization) that contribute directly to the determination of a final product. Thus the chain encompasses the complete sequence of operations which starts from raw material or an intermediate product and finishes downstream, after several stages of transformation/ value addition of one or several final products at the level of the consumer (FAO, 2005).

Supply chain can also be defined as i) a network of retail, distribution and storage facilities supply that participate in the sale, delivery and production of a particular product, and ii) the flow of goods or services from the raw material, intermediate products to final products through processes that are performed by firms that are owned by various actors who are linked in trade and services, each adds value to the product.

According to FAO (2005), the supply chain analysis involves working across multiple enterprises or companies to shorten the supply chain in time so as to deliver the goods and services to consumers. It mainly involves the following: reducing inventories, improving forecasting, improving scheduling and planning, and increase returns. The ultimate goal of the chain is to facilitate an increase in efficiency and thereby, increase the total generated value and competitiveness of the intended actors to increase their shares of the total general income.

2.1.4 Marketing channels

According to Giles (1973), the term 'channels of distribution' or market channels refer to the system of marketing institutions through which goods or services are transferred from the original producers to the ultimate users or consumers. Most frequently a physical product transfer is involved, but sometimes an intermediate marketing institution may take title to goods without actually handling them.

Kohls and Uhl (1990), cited by DucHai (2003) defined marketing channels as the alternative routes of product flows from producers to consumers. According to Kohls and Uhl (1990), marketing channel starts at the farm-gate and ends at the consumer's front door. The marketing channel approach focuses on firm's selling strategies to satisfy consumer preferences.

According to Kotler (2003) marketing channels is a set of interdependent organizations involved in the process of making a product or services available for use or consumption. Most producers do not sell their goods directly to the final users. Between them stands a set of intermediaries performing a variety of functions. These

intermediaries constitute a marketing channel also called a trader channel or distribution channel. Kotler (2005) also defined market channels as a set of independent organizations involved in the process of making a product or service available for use or consumption by consumers or business their products while the middlemen seeks to earn the greatest profit. A good marketing system has to reconcile with all these points. Few producers sell their goods directly to the final users. However, most producers use intermediaries to bring their products to the market. Intermediaries reduce the amount of work that must be done by both producers and consumers. In effect, consumers need the highest produce value at the lowest possible price; farmers want the highest possible returns from users.

2.2 Jatropha Production and Marketing Performance

2.2.1 Jatropha production and marketing in Africa

Biomass is an important source of energy for the majority of the population in developing countries (Agarwal, 1986). In sub-Saharan Africa (excluding South Africa), it accounts for about 73% of the total energy consumption. In Burkina Faso, Ethiopia, Malawi, Rwanda, Somalia, Tanzania and Uganda, biomass accounts for more than 80% of the total energy consumption. Only a few countries, such as Zimbabwe, Seychelles and Mauritius, depend on biomass fuels for less than 50% of total energy consumption (Agarwal, 1986).

The recent policy developments towards biofuel production focusing on bioenergy and liquid biofuels in particular have been on the political agenda of many African countries. A large group of African ministers signed the statement on renewable in Nairobi in the year 2004, which calls for the promotion of sustainable production of

biomass and its efficient use in all sectors and enhancing the development of renewable energy sources (GEXSI, 2007). Then in 2007, the first "High-level Biofuels Seminar in Africa" was held in Addis Ababa, Ethiopia. The seminar concluded with the adoption of the "Addis Ababa Declaration on Sustainable Biofuels Development in Africa" and an Action Plan (Conliffe and Kulovesi, 2008).

The Action Plan encompasses the development of ethanol, biodiesel, biogas, biomass gasification, and cogeneration as priority sectors, and contains a number of cross-cutting programme areas, including policy and institutional frameworks, financing mechanisms, resource assessments, capacity building and strengthening technical expertise. Both conferences represent official statements confirming that a large number of African countries are willing to promote bioenergy in general and liquid biofuels in particular. Despite political willingness, biofuel production and marketing in Africa is still at an infant stage (Conliffe and Kulovesi, 2008).

2.2.2 Jatropha production and marketing in Tanzania

Biofuel production from Jatropha has recently attracted a great deal of attention in Tanzania. A survey of the emerging Jatropha biofuels sector conducted in March-June 2005 in Tanzania revealed a number of recently-started Jatropha experiments (Eijck and Romijn, 2008; Caniels and Romijn, 2008). From these studies there is a general feeling that Tanzania has a large potential for Jatropha cultivation. One of the reasons is due to the existing high number of projects compared to other South and East African countries as shown in Table 1.

Table 1: Area (ha) under Jatropha cultivation in Tanzania

Year	Expert estimate (Ha)	Projects identified (Ha)
2008/09	11 714	17640
2010	34 286	69870
2015(Projections)	116 000	620 110

Source: GEXSI, 2008.

LARRRI and OLIT (2008) claimed that being located in a region with several net oil importers places, Tanzania is in a unique position to be the regional major supplier. The high population growth (2 to 6 times higher) parallel with a rapidly expanding industrial production growth rate of countries in this sub-region, are pointed out as other advantages. Tanzania is therefore ideally placed to become among leaders in biofuel production globally. This is due to factors such as i) ideal geographic and climatic conditions, ii) availability of land: (about 88 million hectares of suitable agricultural land, of which less than 6% is utilised, iii) Abundant water resources: 3 large lakes, rivers offering irrigation schemes iv) Sufficient ground work conducted: a study has been carried out by GTZ and a Task Force established v) Presence of and interest among local business entities.

According to LARRRI and OLIT (2008), the Government of Tanzania has explicitly recognized the importance and need to develop alternative fuels such as biofuels. In the absence of an appropriate system to coordinate development of biofuels in Tanzania, a mechanism to ensure a shared understanding and setting a framework for the development of National Biofuel Platform in Tanzania was then put in place. Therefore, in March 2006 the Government decided to establish the National Biofuel Task Force with the primary task of formulating and preparing an enabling

environment to facilitate the development (promotion and utilization) of biofuels in Tanzania through putting up the required regulatory frame work.

2.3 The Market Efficiency

An efficient market is one which is capable of moving a product from producers to consumers at lowest cost consistent with the provision of services that consumers demand (Scarborough and Kydd, 1992). It is assumed that an efficient marketing system is a vital means of raising income levels to both farmers and traders engaging in production and trading (Pickney, 1993). If the market is efficient it will increase market surplus, and induce regional and inter-regional trade, which increase the profitability of farming and trading in a short as well as long term period (Amani, 1992).

According to Raju and Von Oppen (1982), before formulating any policies, it is necessary to find out the degree to which the existing value chain can be “efficient” and also to identify and quantify the impact of relevant factors that determine efficiency of marketing system, so that improvements can be directed towards factors which are crucial in determining efficiency. Increased efficiency is in the best interests of farmers, traders, processors, wholesalers, retailers, consumers and the society as a whole. The efficiency of a marketing system is measured in terms of the level and/or costs of the inputs to the system, to achieve a given level and/or quality of output. Such inputs are generally in the form of land, finance, time, manpower, and materials. Efficient marketing optimize the ratio between inputs and outputs.

Generally marketing efficiency is measured in three ways: a) Operational efficiency b) Pricing efficiency and c) Technical efficiency.

i) Operational efficiency

Operational efficiency is measured in terms of marketing costs and marketing margins. An improved operational efficiency is evident where marketing costs are reduced but outputs are either maintained or actually increased. Technological innovations are not the only avenue leading to higher levels of operational efficiency. An organization that improves its raw material procurement practices, by say centralizing purchases, buying in larger quantities or taking advantage of unit freight rates, is likely to increase operating efficiency (FAO, 1999). Therefore, the higher the losses incurred during the operation the lower the level of operational efficiency.

ii) Pricing efficiency

This is measured in terms of correlation of price movements of the same product between pairs of markets to test market integration. Such correlation gives an indication of the degree of integration between markets. Pricing efficiency is concerned with the ability of the marketing system to allocate resources and coordinate the entire agricultural/food production and marketing process in accordance with consumer directives.

Pricing efficiency is evidenced in terms of efficient resource allocation and maximum economic customers' willingness to pay in the marketplace for the produce, commodity or product in question. It is generally accepted that the higher the correlation of prices between pairs of markets for a particular product, the better

integrated the markets are for that crop and hence the higher the efficiency they are operating in terms of price. Competition plays an important role in determining pricing efficiency, and at the same time adding more utility to the products in order to get more market share (FAO, 1999).

iii) Technical efficiency

Technical efficiency refers to the way with which resources are used in marketing, in terms of physical input and output ratios. It should however be noted that these measures do not provide an absolute measure of an overall market efficiency. In a production unit technical efficiency refers to the achievement of the maximum potential output from given amounts of factor inputs, taking into account physical production relationships (Zabaleta *et al*., 2003).

2.4 Marketing Costs

FAO (1999) describes marketing costs as expenses that are incurred when the commodity moves from the farm to the final market, whether they are moved by farmers, intermediaries, cooperatives, marketing boards, wholesalers, retailers or exporters. With increased urbanization and industrialization, marketing costs tend to increase the relative farm gate price received by the farmer. An example is when the product moves greater distances, through more intermediaries and is more sophisticated in its packaging.

Marketing costs can also reflect the state of a country's development in terms of increased standards of living, smaller proportions of income expended on raw products of the farm and greater proportions of income that are spent on additional

and improved marketing services. Increasing the value added means, among other things, that more people in developed countries are involved in marketing agricultural products than in producing them. Marketing costs include labor, transport, packaging, containers, rent, utilities (water), depreciation allowances and interest charges (FAO, 1999).

2.5 Market Margins

Scarborough and Kydd (1992) defined market margins as 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 quantity and quality of a commodity. However, it may also describe price differences between other points in the marketing chain, for example between producer and wholesale, or wholesale and retail, prices. Price spreads can be calculated on the basis of two methods: i) The net price received by the farmer which is calculated by deducting the marketing costs from the original price paid by the farmer by the middlemen and ii) The net margins are calculated by subtracting the sum of all operating costs from gross margins.

2.6 Price Transmission

Price transmission usually shows how quickly and to what extent price differentials (net of transactions costs) between two spatially distant markets are eliminated (Obstfeld and Taylor, 1997). The assessment of price transmission along the supply chain, i.e. how much and how fast price changes are passed through between different stages of the chain, is often used as an indicator of the effectiveness and efficiency of the chain as well as of the degree of competition in processing and

distribution. The assessment of price transmission typically aims at addressing the following issues: i) The magnitude of the price adjustment, i.e. how much of the price change at one step of the produce supply chain which is transmitted to the downwards step, ii) the speed of the price adjustment, i.e. the pace at which changes in prices at one level of the supply chain are transmitted to the other levels, and iii) the asymmetry of the price adjustment, i.e. to what extent price increases and decreases are transmitted differently in terms of magnitude and speed.

Meyer and von Cramon-Taubadel (2004) found that the issue of Asymmetric Price Transmission (APT) has received a considerable attention in economic literature because of the size of some markets on which APT takes place (such as petroleum markets), global dependence on some products (again oil) and the share of income spent by average household on some products (again petroleum products). APT is important from the welfare point of view. One must remember that APT implies welfare redistribution from agents downstream to agents upstream (presumably consumers to large energy companies), and it has serious political and social consequences (Babbie, 1990).

2.7 Review of Analytical Techniques in Marketing Efficiency Analysis

The following analytical techniques are frequently used in marketing efficiency analysis: Market Channel Baseline Analysis, Concentration ratio, Market margin analysis, and Gross margin analysis. Regression analysis is also used to assess the factors that contributed to the market efficiency in terms of price (price efficiency) in the chain for farmers and traders. These are briefly discussed in the following sub-sections.

2.7.1 Market channel baseline analysis

MCBA is an analytical technique used to assess the way a market channel operates. It records all actors in the value chain from production to final consumers. The actors carrying out similar functions are grouped together and product flows in and out are recorded. Finally, the constraints which hamper the facilitation of the product flow from producers to consumers are assessed. The MCBA is suitable in identification of the structures, interaction and constraints of the actors (Mgaya, 2008).

The analysis of marketing channels provides a systematic knowledge of the flow of goods and services from their origin (farmer) to their final destination (consumer). This knowledge is acquired by studying the participants in the process those who perform physical marketing functions in order to obtain economic benefits. In carrying out the functions, marketing agents achieve both personal and social goals. They add value to production and in so doing help satisfy consumer needs. This price also serves as a signal to all the actors in the marketing channel, i.e. farmers, rural assemblers, transporters, wholesalers, and retailers (Mendoza, 1995).

2.7.2 Concentration ratio

Market power is the ability of a firm to alter the market price of a good or service. It is the ability to raise prices without losing customers to competitors. In perfectly competitive markets, market participants have no market power. A firm with market power has the ability to individually affect either the total quantity or the prevailing price in the market or both (Sexton and Zhang, 2001). Market power can be measured by different measurements. One of them is the concentration ratio (CR). The CR can be calculated as a ratio of the total quantity of the products

sold/purchased by the four big buyers (wholesale) to the total quantity of the products sold/purchased in the marketing season.

According to Pomeroy and Trinidad (1995), the concentration ratio plays an important role in the determination of market behaviour within an industry because it affects the interdependence action of firms. Similarly, according to Kohls and Uhl (1990), a CR of over 50% is an indication of strong monopolistic firm, while a CR of between 33% and 50% indicates weak monopolistic firm. A CR of less than 33% shows unconcentrated firm. An unconcentrated market structure reflects a high level of competition, which is necessary for increasing market efficiency (Bryceson, 1994).

The CR analytical tool is useful in the identification of the market structure and power which determines the degree of competition that exists in the particular segment (Hervan, 2005). It is generally used to indicate the level of competition within the segment as well as the absence of an oligopolistic market structure (Hardwick *et al.*, 1996). Furthermore, CR is used as a guide for indicating the most likely type of market structure and levels of competition within a given market segment (Mukwenda, 2005).

The CR analytical tool has been used in the agro-industry by several researchers such as Mukwenda (2005) for maize marketing in Njombe District, Gabagambi (1998) in the analysis of rice marketing in Ulanga District and Kohls and Uhl (1990) in the analysis of spice marketing. The study by Mukwenda (2005) had a CR of 111%

which indicates that there is an oligopolistic market structure implying less competitive of maize market in Njombe District. Furthermore, the CR obtained by Gabagambi (1998) was low at about 26% indicating that there was no strong group of traders who controlled rice marketing in Ulanga District. In the study on spice marketing by Mshote (2006) the CR was determined by looking at the proportion of total purchase accounted for by few largest buyers to the total volume handled. Experts of using this analytical technique usually recommend calculating the CR of homogeneous groups of the sample in order to find out the segment which is not competitive and inefficient.

It is generally believed that higher market concentration indicates non-competitive behaviour and thus inefficiency. Devine *et al*., (1984) concluded that buyer concentration is analogous to seller concentration, and in principle a range of absolute and relative measure of buyer concentration corresponding to those of seller concentration could be constructed. However, such measures have not been constructed, to the absence of product by purchasing firms. The relationship between concentration, market behaviour, and performance must not be interpreted in isolation. Other factors such as the firms' objectives, barriers to entry and exit, economics of scale, and assumptions about rival firms' behaviour are all relevant in determining the degree of concentration and the relationship between concentration and behaviour and market efficiency (Scherer, 1980).

2.7.3 Regression analysis

Regression analysis is a statistical forecasting model that is concerned with describing and evaluating relationship between given variables i.e. the dependent and

independent variables. The regression analysis can be used to predict the outcome of a given dependent variable based on the interaction of other related explanatory variables. Regression models depend on several assumptions. Firstly, the predictors must be linearly independent i.e. it must be possible to express any predictor as linear combination to others. Secondly, error terms must be normally distributed and independent and, thirdly, the variance of the error terms must be constant (Manage, 2007).

In this study the regression analysis was used to assess the factors that contributed to the efficiency in terms of price (price efficiency) in the chain for farmers and traders (Equation 1). This approach was also used by Gabagambi (1998) in pricing efficiency analysis. Price analysis is an indirect approach for determining market efficiency. Efficient marketing systems are characterized by a high degree of price integration loosely correlated movements of connected series of price over space, form, and time.

$Y=\alpha+\beta X_i+\mu$ ..... (1)

Where:

Y = Dependent variable,

X_i = Independent variables,

α = Constant term, μ=error term,

β = Degree to which independent variables influence dependent variable at a given marketing level.

2.7.4 Market margin analysis

Scarborough and Kydd (1992) defined market margins as 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 quantity and quality of a commodity. However, it may also describe price differences between other points in the marketing chain, for example differences between producer and wholesale, or wholesale and retail, prices. The market margins can be calculated by using the following equation.

$$TGMM = \frac{(Endbuyerprice - Firstsellerprice)}{End\ buyer\ price} X\ 100 \quad \ldots\ldots (2)$$

Where:

TGMM = Total gross market margin.

2.7.5 Gross margin analysis

Gross Margin (GM) is a technique that is used to establish the economic profitability. It is given as a difference between the gross income accrued and the variable costs incurred. The analysis is therefore a simplified tool, but in many cases, a sufficiently powerful tool for economic analysis (Makeham *et al.*, 1986). The GM enables one to directly compare the relative profitability of similar enterprises and consequently provides a starting point to deciding or altering the farms overall enterprise mix. Most often, new technologies in smallholder farmers are aiming at increasing the farm productivity by the fact that increasing income is one of the immediate objectives of the individual farmer or group of farmers (Ferris, 2000; Mutayoba, 2005).

It is important to compare GM of different market participants to know whether or not farmers and traders are able to pursue their economic activities sustainably. To define the concept of gross margin, variable costs and fixed costs have to be distinguished. Variable costs are those cost that increase or decrease as output changes (Cramer *et al*., 2001). Common examples of variable costs in crop production include seeds, fertilizers, and pesticides. The most important fixed costs in agricultural production are owned land, farm buildings, machinery and implements.

According to Mutabazi (2007) gross margin analysis is static and does not take into consideration the time value of money compared to investment analysis. The key advantages of GM analysis as an economic analytical tool include its easiness to be understood, its ability to draw logical interrelation of economic and technological parameters and its ability of rational variants for the operational structure of an enterprise or individual farmers (Phillip, 2007). Johnsen (2003) concluded that although gross margin is not a good measure of profitability, it remains the most satisfactory measure of profitability in small enterprise.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Description of the Study Area

3.1.1 Geographical location

The study was carried out in Arumeru and Monduli Districts (Fig. 2) in Arusha Region. Arusha Region is located in north-eastern corner of Tanzania. It lies below the equator between latitudes 2° and 6°. The Region is situated between latitudes 35° and 38° East and longitudes35° 40′ and 3° 21′ South. The Region has a common border with Kenya in the North, to the east it borders with Kilimanjaro and Tanga Regions. To the South it shares with Dodoma Region and to the West with Singida, Shinyanga and Mara Regions. Monduli District is bordered to the North by Kenya, to the East by Kilimanjaro Region and Arumeru District, to the South by Manyara Region and to the West by the Ngorongoro and Karatu Districts. Arumeru District is bordered to the North and West by Monduli District, to the East by the Kilimanjaro Region and to the South by Arusha District and the Monduli Districts (URT, 2011).

3.1.2 Land area and administrative units

The total area of Arusha Region is 82 428.5 square kilometres; out of this a total area of 3 571 square kilometres (4.3 percent) is covered by water bodies of Lakes Eyasi, Manyara, Babati and Natron. The remaining 78 857.5 square kilometres is land area.

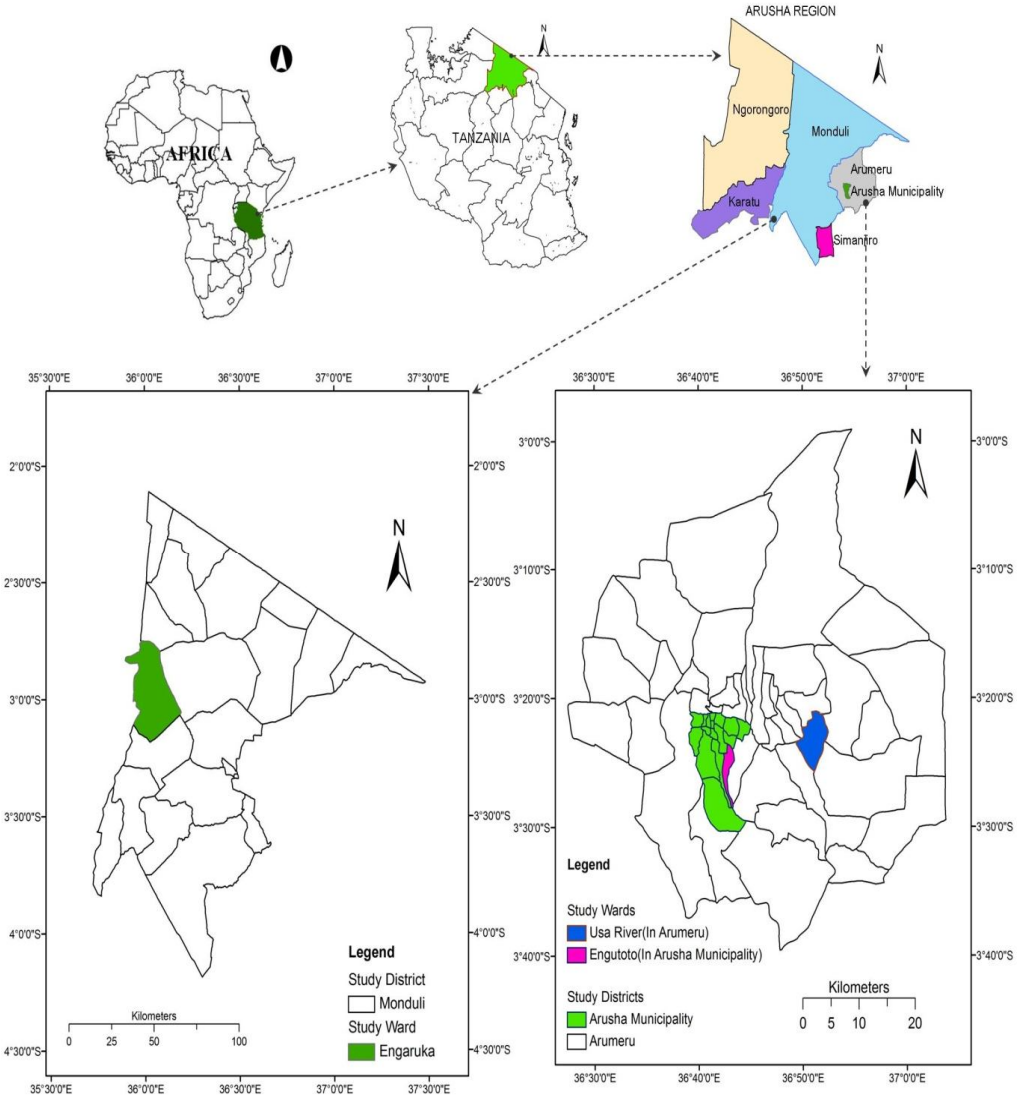

Figure 2: Location of the study areas

Source: Arusha Municipal Council

Arusha Region is the largest Region in the country (Tanzania Mainland) occupying 9.2 percent of Tanzania main land total area of 942 784 square kilometres. Arusha Region is divided into five Districts namely: Ngorongoro, Arusha, Karatu, Monduli and Arumeru (NBS, 2002). The total area of Monduli District is 14 201square kilometres and that of Arumeru Districts 2 896square kilometres. Monduli District has three divisions, fourteen wards and forty nine villages while Arumeru District has six divisions, thirty seven wards and hundred and thirty three villages (NBS, 2003).

3.1.3 Demography

According to the National Census in 1988, the population of Arusha was 1 351 675 individuals and the current projections for the National Census in 1998 indicate that the population is 1 963 200 individuals. Based on 2002 Tanzania national census, the population of Monduli District is 185 237 and that of Arumeru District is 516 814. Engaruka village is divided into Engaruka Juu and Engaruka Chini. Engaruka Juu has 6 214 inhabitants and Engaruka Chini has 5 200 inhabitants (NBS, 2003).

3.1.4 Economic activities

The main activity in both Districts is agriculture (cropping and animal husbandry). Majority of the population (60%) in these areas depend on agriculture for their livelihood. Both cropping and livestock keeping are the major economic activities undertaken in Monduli District. Major crops include: maize, *Dolicos lablab* (locally called *ngwara* or *fiwi*), banana and cassava and Jatropha. Livestock keeping is very common in both Districts. All kinds of agricultural activities, including a variety of food and cash crops, livestock keeping, dairy production are viable in these areas.

Despite these activities being highly common around these places, there are other economic activities such as business activities, tourism and formal employment that are also undertaken.

3.2 Research Design

The research design used was a cross-section survey done at a single point in time. This design is useful for descriptive purposes and in obtaining qualitative information as well as for determination of relationship between variables (Bailey, 1998). Furthermore, it allows a researcher to efficiently utilize the economic resources in terms of time and funds.

3.3 Sampling of Jatropha Market Practitioners

Selection of the sample of Jatropha market chain actors was initially done using the stratified random sampling technique, because the targeted population constituted of heterogeneous groups i.e. farmers, traders, processors and consumers. Based on organizational considerations and availability of market chain activities, selection of respondents was based on the available resources to undertake the study as well as the sample frame of the respondents. Therefore, this led to choosing minimum selection of sample for certain groups of respondents. For instance, 30 people are the minimum number of sample size that can be used to represent a population. However, only five sampled processors were selected in this study. This was due to their availability in this study area as explained in section 3.3.3. The population was divided into several strata and then respondents from each stratum were randomly selected to constitute the sample size. Since each stratum is more homogeneous then a precise estimate was done. A simple random sampling was then used to obtain a

representative sample of Jatropha market participants based on their respective locations. A total sample of 130 market chain actors consisting of 80 farmers, 25 traders, 5 processors and 20 consumers were selected for the study as shown in Table 2 and described in the following sub-sections.

Table 2: Detailed sample structure by sample area

Market chain actors	Sample areas	Frequency(n)	Percent (%)
Farmers	Engaruka villages	80	62
Traders	Engaruka villages	25	19
Processors	Njiro and USA river	5	4
Consumers	Njiro, A-town, Kijenge, Mbauda and Sakina	20	15
Total		130	100

3.3.1 Sampling of Jatropha farmers

From a sampling frame of 309 Jatropha farmers provided by Engaruka village officers, 80 Jatropha farmers were randomly selected. The choice of Jatropha farmers from the study area was based on the high availability of Jatropha seeds production as well as willingness of the farmers to respond to the questions.

3.3.2 Sampling of Jatropha traders

In accordance with the sampling frame of approximately 97 traders provided by Engaruka village officers, a total number of 25 traders were randomly selected. None of the sampled Jatropha traders were selected from Arumeru District. This is because respondents from Arumeru were not engaged in Jatropha seeds marketing. Therefore, this choice was based on high availability of Jatropha seeds marketing.

3.3.3 Sampling of Jatropha processors

A total of 5 processing companies were purposively selected from Arumeru District, specifically from Njiro and USA river areas. Arumeru District officials assisted in the identification of the processing plants including their locations and contacts. Purposive selection of these companies was done mainly because Jatropha investment is still at small scale therefore Jatropha processing plants in Tanzania, particularly in Arumeru are also few in number. Therefore, the distribution in selection was based on location.

3.3.4 Sampling of Jatropha consumers

Selection of Jatropha products consumers was very tricky because there was no specific sampling frame that was used as a benchmark for sample selection. Regarding that Jatropha products are still new to majority of Tanzanians; therefore it was hard to identify who used these products looking at household level. Therefore, according to this circumstance, the approach used to draw the sample involved selecting consumers randomly at the processing companies. This means consumers who came to buy Jatropha products were randomly selected and they were asked to respond to questions. A total of 20 consumers were randomly selected to constitute the sample.

3.4 Data Collection Methods

Data for this study were obtained through primary and secondary sources during field survey that was carried out in November 2010.

3.4.1 Primary data collection

Primary data were collected in two Districts namely Monduli and Arumeru using a semi-structured questionnaire with closed and open ended questions. Pre-testing of the questionnaire was done to check for any ambiguity. Therefore, addition, deletion of some of the questions and the modification of several models was done.

3.4.2 Secondary data

Secondary data were obtained from Sokoine National Agriculture Library (SNAL) and internet. Other sources included books, publications and journals. Some information was obtained from the District offices and Companies as well as from people (village officials and District officers) who had information relevant to the study.

3.5 Pre-testing of the Questionnaire

Pre-testing of questionnaire was conducted prior to the main fieldwork as the basis of improving the instrument. Questionnaire pre-testing involved 20 respondents from Engaruka village and Arusha town and was conducted one week before the general survey. This activity was done in order to check if the questionnaires were comprehensive enough to collect the required data. After the pre-testing, modifications were made to the questionnaires and improved versions of the questionnaires were developed.

3.6 Data Processing and Analysis

The Statistical Package for Social Science (SPSS) and Microsoft excel were used for both qualitative and quantitative data analysis in order to achieve the stated objectives. The responses from the interviewed respondents were coded and

summarized and then the above mentioned software packages were used for analysis. Descriptive analysis was then employed for means, frequencies, percentages, graphs and ranges, while quantitative analysis involved the use of correlation, market concentration index, gross margin, market margin and price transmissions analysis. The results were then presented in terms of percentages and graphs such as histograms, pie and line charts. Details are described in the following sub-sections.

3.6.1 Jatropha marketing channels and the marketing power among the actors

3.6.1.1 Analysis of Jatropha marketing channels

(a) Market channels analysis

Market Channel Baseline Survey (MCBS) was used to identify the market channels of the Jatropha market participants. The MCBS helped to record all the actors in the Jatropha value chain from production to final consumers. The actors carrying out similar functions were grouped together and recorded product flows in and out were mapped. Data on product sources, customers and costs of marketing were overlaid on the market chain map.

(b) Descriptive analysis

Frequency analysis was used to assess the opportunities and the constraints which hampered the facilitation of Jatropha flow from the producers to consumers during production and marketing activities.

3.6.1.2 Analysis of marketing power among the actors

The concentration ratio (CR) was used to assess the market structure in terms of market power. The Jatropha farmers and traders were arranged in ascending order according to the amount/volume of Jatropha handled by big four farmers and traders in the 2009/2010 marketing season, and then the CR was calculated. A total volume of Jatropha handled by all the farmers and traders for price speculation was also calculated. Finally the CR for both farmers and traders were calculated by taking the proportion of the total volumes of the selected big four farmers and traders divided by total volumes of Jatropha handled by all the farmers and traders engaged in Jatropha marketing activities. The CR was expressed as a percentage as shown by (Equation 3).

$$CR = \frac{Cp}{Ip} X\ 100 \quad (3)$$

Where:

CR = Concentration ratio

Cp = Total quantity of Jatropha products purchased by four big buyers along the chain

Ip = Total quantity of Jatropha products marketed in the study area

3.6.2 The pricing efficiency of the Jatropha marketing chain

The interface pricing efficiency model was used to determine the degree of interface pricing for both farmers and traders. The degree of interface pricing efficiency was used to test the correlation between the prices, i.e. to determine whether or not price

changes were passed onto the market level (Schmidt, 1979). This was done through running a simple regression model (Equation 4).

$MM = f\,(P_i+\mu)$ ..... (4)

Where:

MM = Market Margin,

Pi = Buying price at a specified market,

μ = Error term

3.6.3 Gross and market margins of Jatropha value chain actors

(a) Analysis of gross margin

The GM was done to determine the returns realized by the farmers, traders and processors. The GM provides insights into marketing characteristics to assess the contribution of Jatropha marketing to the income of the respondents. According to Mutabazi *et al.* (2006) gross margin analysis is static and does not take into consideration the time value of money compared to investment analysis. GM technique does not take into account variations in fixed cost structure within and or among enterprises. However, the GM can still assist in enhancing the overall management as it addresses resource productivity in a given period. An added advantage of GM is that it can easily be understood and it has logical interrelationship between economic and technological parameters (Castle *et al.*, 1987; Senkondo *et al*., 2004). GM was derived using the data on variable costs and the revenue based on prices. The formula is given as follows (Equation 5):

$GM_i=TR_i-TVC_i$ ..... (5)

Where:

GM = Gross Margin of either farmers, traders, processors (Tshs/kg);

TR = Average total revenue of either farmers, traders, processors (Tshs/kg);

TVC = Average total variable cost of either farmers, traders, processors (Tshs/kg);

i = 1-n^{th} farmers, traders, processors.

Average total revenue was calculated by multiplying the average yield in kilogram by the average market price of the crop. Total variable costs were obtained directly from the respondents during the interviews. The costs involved include the production costs, storage cost, transportation cost, processing cost, loss due to damage and hired labor cost. Labour is arguably the most significant investment in subsistence agriculture and failing to introduce labour as an input may not allow for an accurate representation of agricultural production. Therefore, taking into account of the inadequate development of the labour markets and complexity surrounding valuation of family labour, the family labour was not valued in terms of monetary terms in this study but rather as man-days. Studies like Senkondo *et al*., (2004) and Fox *et al*. (2005) provide an understanding of different views on how to handle valuation of family labour in rural communities.

(b) Analysis of market margin

Market margin analysis was used to assess the difference between prices at two market levels (sellers and buyers). It was used to describe price differences between other points in the marketing chain, for example between producer and wholesale, or wholesale and retail, prices. According to Scarborough and Kydd (1992), the term market margin is commonly used to refer to the difference between producer and consumer prices of an equivalent quantity and quality of a commodity. MM was derived using the data on buying and the selling prices based on prices.

The formula is given as follows (Equation 6):

$$TGMM = \left(\frac{End\ buyer\ price - First\ seller\ price}{End\ buyer\ price}\right) X\ 100 \quad (6)$$

Where:

TGMM = Total gross market margin

3.6.4 Price transmission from the producer to ultimate consumption and utilization

Price transmission was assessed by calculating the shares for Jatropha market participants i.e. (i) Producers' share (ii) Traders' share and (iii) Processors' share. Through these relationships the issue of price transmission was then observed since APT implies welfare redistribution from agents downstream to agents upstream (presumably consumers to large energy companies) and it has serious political and social consequences (Meyer and von Cramon-Taubadel, 2004).

i) Producer's share equation

$$PS = \frac{PX}{\frac{Rp}{S}} = \frac{\left[1 - \left(\frac{MMf}{Rp}\right) x\ 100\right]}{S} \quad (7)$$

Where:

PS = Producer's share,

PX= Producer's price, Rp =Retail price,

MMf = Market Margin of farmers,

S= Sum of average share (throughout).

ii) Trader's share equation

$$TS = \frac{TX}{\frac{Rp}{S}} = \frac{\left(1 - \left(\frac{MMt}{Rp} x\ 100\right)\right)}{S} \quad \text{.....} \quad (8)$$

Where:

TS = Trader's share,

TX= Trader's price,

Rp =Retail price,

MMt = Market Margin of traders,

S= Sum of average share (throughout).

iii) Processor's share equation

$$PRS = \frac{PRX}{\frac{Rp}{S}} = \frac{\left[1 - \left(\frac{MMpr}{Rp} x\ 100\right)\right]}{S} \quad \text{.....} \quad (9)$$

Where:

PRS = Processor's share,

PRX= Processor's price, Rp =Retail price,

MMpr = Market Margin of processors,

S= Sum of average share (throughout).

3.7 Limitations of the Study

In some cases, it was difficult to locate some of the respondents (especially traders and consumers from Arumeru District); majorities were busy engaging in other economical activities. Language barrier was another problem because majority of respondents from Engaruka villages were unable to understand and speak good Kiswahili. Also, the information sought from some of the respondents was based on past experiences; therefore, it was somehow hard to recall especially considering that majority of those respondents did not keep records. Again, some respondents were a bit reluctant to provide sensitive details such as questions involved their income earned, number of children and size of land owned. Due to bad weather including frequent rains and storms particularly in Engaruka villages, the process of data collection became hard and time consuming.

In overcoming these limitations, the researcher had to translate many questions into the Masaai language through a third party although this might have led to inaccuracy of some answers. Moreover, the research team spent some additional time looking for respondents and sometimes call-backs and physical revisits were done. Whenever there was rain, interviews had to be cancelled until the rain stopped; however, this caused some of the respondents not to come back for another session when they left.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSION

4.1 The Market Channels for Jatropha and Marketing Power among the actors

4.1.1 The Jatropha market channels

The MCBA undertaken found that there were various channels through which Jatropha seeds pass from the producers via middlemen and finally to the ultimate consumers. The assessment of market channels aimed at explaining roles played by Jatropha market participants in the chain in order to provide the product with time, form and place utilities. Market efficiency thus requires a well planned network that assigns well defined functions to its members. From this network, market participants attained their individual and social targets. In this study, the following market participants in the Jatropha market chain were identified: i) Farmers from both villages i.e. Engaruka Juu and Engaruka Chini, ii) traders (including both wholesalers and retailers from both Engaruka Juu and Engaruka Chini), iii) processing companies from Arumeru, and iv) consumers who are the buyers of the Jatropha products such as oil or fuel, soaps and fertilizers.

4.1.2 Farmers

Farmers were the first link in the Jatropha market chain, since they were the primary producers of Jatropha seeds. Results in Fig.3 show that Jatropha farmers sold their seeds through different channels. The main three buyers identified were the local

individual buyers, companies and both local buyers and companies (Table 3). However, according to these results the most prominent buyers of Jatropha seeds from farmers were the local buyers (71%).This might be attributed by that the majority of farmers relied on middlemen to facilitate their trading activities and moreover they were unable to facilitate transportation costs to market places in town, where many companies are located. It was also observed that about 30% of the farmers (included those who sold to either individual companies or to both the local buyers and companies) also sold their seeds to the four major companies which include KAKUTE, DILIGENT, JPTL and TaTEDO. Results in Table 3 indicate that DILIGENT Company bought the seeds from the farmers in large quantities (37.5%) compared to the other companies.

During the focus group discussions with farmers, they informed that most of their customers (59%) came directly to negotiate prices with their customers at the village market (Table 4) due to a higher concentration of buyers around these places. However, village markets were regarded as seasonal markets having specific days of the week for operating.

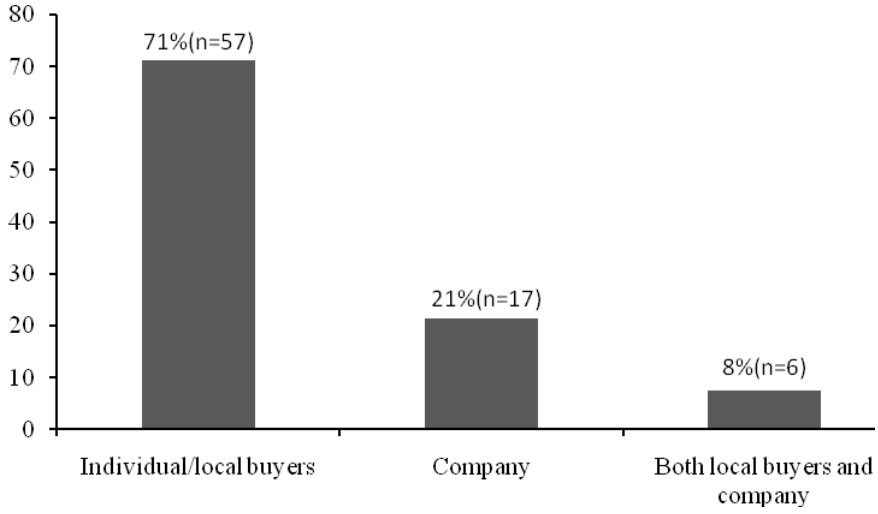

Figure 3: Major buyers of Jatropha seeds

Table 3: Major companies buying Jatropha seeds from farmers

Company name	Frequency	Percent
KAKUTE	6	25.0
DILIGENT	9	37.5
JPTL	5	20.8
TaTEDO	4	16.7

Table 4: Places where farmers meet their buyers

Place/area	Frequency	Percent
At home	24	30
At the field/farm	9	11
At market places	47	59
Total	80	100

4.1.2.1 Link between farmers and the traders

The wholesalers go straight to farmers where they negotiate prices. Once they have reached an agreement, the wholesalers purchase the seeds from the farmers. Farmers reported sometimes wholesalers do not stick to the agreements made and fail to buy the seeds at the agreed prices, therefore when this happens farmers directly sell their seeds to retailers or companies.

4.1.2.2 Link between farmers and the processors

The company agents usually buy the seeds either from the farmers directly or from the traders i.e. wholesalers and retailers. The farmers and the company agents negotiate prices and once an agreement is reached, the processors purchase the seeds from the villages and transport them to their processing companies in Arusha town.

4.1.3 Traders

The results show that majority of traders (48%) were the retailers of the Jatropha seeds (Table 5). This group occupies a larger percent of Jatropha seeds traders, and provides necessary marketing information such as prices and customers' preferences to other functionaries.

Table 5: Categories of traders

Category	Frequency	Percent
Wholesaler	11	44
Retailer	12	48
Both whole seller and retailer	2	8
Total	80	100

The major buyers of Jatropha seeds among the traders are shown in Table 6. The major buyers of the Jatropha seeds from the traders were companies (52%). The main reason behind these observations could be due to the fact that the traders highly depend on companies to be their main customers since they can make high profit compared to other customers (local buyers).

Table 6: Major buyers of jatropha seeds among traders

Buyer	Frequency	Percent
Local traders	5	20
Companies	13	52
Both local traders and companies	7	28
Total	25	100

The results indicate further that the main companies buying the seeds from the traders include KAKUTE, DILIGENT, KAMA, TaTEDO, JPTL and Nishati Sabuko (Table 7). Moreover, results show that DILIGENT Company was leading (35%) in terms of purchasing the Jatropha seeds from the traders compared to other companies.

Table 7: Major companies buying Jatropha seeds among traders

Company name	Frequency	Percent
KAKUTE	6	30
DILIGENT	7	35
KAMA	1	5
TaTEDO	2	10
JPTL	3	15
Nishati Sabuko	1	5
Total	20	100

The companies purchased Jatropha seeds from traders upon negations made between them. Several activities such as loading, transportation, off loading, storage were done. Lorries and pickups were the most common means of transport used by many companies' agents. Loading and unloading were done manually. Jatropha seeds were transported from Engaruka villages to Arusha town.

4.1.4 Processing companies and consumers

The processing companies were linked with the consumers because the consumers were the ultimate users of the products produced by them. However, it was shown that majority of people were still not aware of the products resulted from the Jatropha seeds.

Several forms of Jatropha products were produced by the companies, which were then sold to the ultimate consumers within or outside Arusha Region. Finding in Table 8 show that both oil or fuel and soaps were highly produced (60%) by the processors. This might be due to fact that these products were considered to be well known and used by the majority of consumers compared to the other products.

Table 8: Major forms of Jatropha products produced by processors

Product form	Frequency	Percent
Soap	1	20
Oil/fuel and soap	3	60
Oil/fuel, soap and fertilizer	1	20
Total	5	100

The major buyers of these products included local consumers (40%), local traders and consumers (40%), and local consumers and traders and interregional traders (20%) as shown in Table 9.

Table 9: Major buyers of Jatropha products produced by processors

Buyer	Frequency	Percent
Local consumers	2	40
Local consumers and traders	2	40
Local consumers, traders and inter regional traders	1	20
Total	5	100

Majority of the consumers (55%) reported to have bought Jatropha products from KAKUTE Company. The main reasons which made them to buy Jatropha products are summarized in Table 10**.**

Table 10: Preferences for buying Jatropha products

Reason	Frequency	Percent
Cheap	1	5
Quality/good products	11	55
Cheap/quality/economical	8	40
Total	20	100

The study revealed that the existing Jatropha market channels involved a number of channels and not just one single channel (Fig. 4).Four main channels were identified.

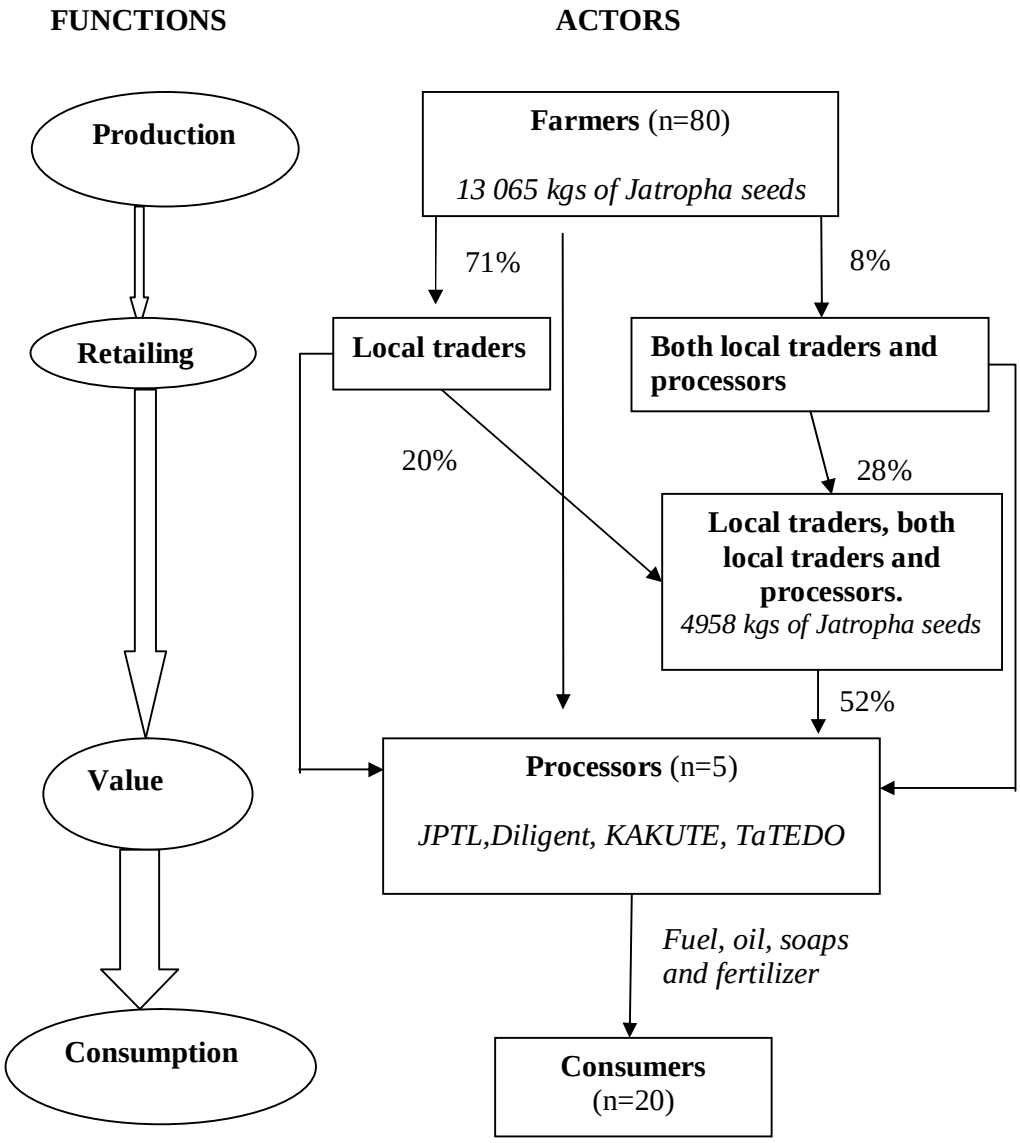

Figure 4: The Jatropha market channel

Channel I: Farmers – processors – consumers

Channel II: Farmers – local traders – processors – consumers

Channel III: Farmers – both local traders and processors – processors – consumers

Channel IV**:** Farmers – local traders – both local traders and processors – processors – consumers

The channels show the total quantity of Jatropha seeds produced by sampled farmers was about 13 065 kg. As can be understood from Fig. 4, the main receivers of Jatropha seeds from farmers were local traders, both local traders and processors, processors with an estimated percentage share of 71, 8, and 52 respectively. Consumers received Jatropha products such as soap, oil and fertilizers from the processors. Besides, the volume and number of actors involved through each channel was compared and based on the results; channel IV was considered the longest. The shortest of all channels was channel I because it involved direct sale of Jatropha seeds from farmers to processors and finally to the ultimate consumers hence few number of actors involved and less volume compared to other channels.

4.2 The Market Concentration Ratios for Farmers and Traders

Market concentration ratio (CR) was determined for both farmers and traders so as to assess their market power. The ratio obtained helped to provide an understanding on the concentration of the Jatropha sellers in the market using Khols and Uhl (1990) rule of thumb market concentration indicative indices. According to Kohls and Uhl (1990), the CR of over 50% is an indication of strong monopolistic firm, while a CR

of between 33% and 50% indicates weak monopolistic firm. A CR of less than 33% shows unconcentrated firm.

The CR analytical approach has been used by several researchers such as Kotler and Armstrong (2006) who noted that marketing of cotton in Kahama District is an oligopoly, since the CR was high (77%). The study by Mukwenda (2005) had a CR of 111% which indicated that there is an oligopolistic market structure implying less competitive of maize market in Njombe District. However, different and contrasting results were reported by Gabagambi (1998) in the case of rice marketing in Ulanga District where the CR was found to be 26% indicating that there was no strong group of traders who controlled the rice marketing Ulanga District.

The concentration for Jatropha farmers was calculated from the total quantity that was sold by the farmers to the four big Jatropha buyers (wholesalers) divided by the total quantity of the same number of farmers sold to different buyers (total quantity of the products sold in the marketing season 2009/10).The same procedure was used to calculate Jatropha sellers' concentration ratio. It was found that the CR for farmers and traders were18% and36% respectively (Table 11). These results indicate that the market for Jatropha farmers is unconcentrated while that for traders was found to have weak oligopolistic behaviour. Tendency of small number of consumers' preference on purchasing Jatropha products might be one of the reasons that make Jatropha farmers unconcentrated.

Table 11: Concentration indexes for farmers and traders

Variables	**Farmers (n=80)**	**Traders (n=25)**
Cp(kgs)	2370	1760

Ip(kgs)	13065	4958
Market CR(%)=(Cp/Ip)*100	18.06	35.49

Cp =Total quantity of Jatropha products purchased by the four big buyers, Ip=Total quantity of Jatropha products marketed in the marketing season.

The results also indicate that the Jatropha marketing for traders is non- competitive due to the existence of a weak oligopolistic market structure. This encourages the existence of traders' who potentially collude to set prices of the Jatropha seeds. Price collusion by traders reduces market competitiveness which in turn, reduces market efficiency. When the market is competitive, a normal profit is encouraged which limits any tendency for customers services and satisfaction levels to fall.

4.3 Marketing Efficiency of the Jatropha Value Chain

Market efficiency measures selected included the gross margins, market margins and the interface price efficiency (measured in terms of correlation of price movements of the same product between pairs of markets to test market integration). Both the gross and market margins were used to measure producers, traders and processors performance.

4.3.1 Gross margin analysis

The profitability of Jatropha marketing was estimated using the Gross margin analysis (GM). The results in Table 12 give a summary of the GM for farmers, traders and processors. The results show that the GMs for farmers, traders and processors were 10 929 Tshs/kg, 37 235Tsh/kg, and 1 363 610Tsh/kg respectively. This indicates that Jatropha processing is the most profitable (1 363 610Tsh/kg) marketing enterprise compared to Jatropha farming and trading. These observations could be attributed by the fact that Jatropha processing involved value addition to new products such as oil, fertilizer and soaps, which when sold they bring profit to

the companies. Moreover, value addition of the products tends to allow the processors to fetch relatively higher selling prices at the market compared to that for farmers and traders. The GM for farmers was lowest (10 929Tsh/kg) compared to other actors. This could be due to the fact that majority of Jatropha farmers sold their seeds at lower prices and they are still facing a number of production and marketing challenges, the most critical being high production costs incurred during farming activities. Therefore, this shows that the Jatropha farmers are still not benefiting from Jatropha production due to the lower returns earned.

Table 12: Gross margins for Jatropha farmers, traders and processors

Actors	Description	Sales/Costs (Tshs)	Percent (%)
Farmers	Average revenue (Tshs)	51249.02	
	Less		
	Average costs (Tshs)	40 320	
	Average Gross Margin (Tshs/kg)	10929.02	21%
Traders	Average revenue (Tshs)	134897.44	
	Less		
	Average costs (Tshs)	97 662	
	Average Gross Margin (Tshs/kg)	37235.44	27.6%
Processors	Average revenue (Tshs)	3 643 110	
	Less		
	Average costs (Tshs)	2 279 500	
	Average Gross Margin (Tshs/kg)	1 363 610	37.42%

4.3.2 Marketing cost and margin analysis

The marketing margin refers to the difference between prices at different levels in the marketing system. The total marketing margin is the difference between what the consumers pay and what the producers/farmers receive for their produce. In other

words it is the difference between retail price and farm price. A wide margin usually means high prices to consumers and low prices to producers. A review of the marketing costs would estimate how much expenses are incurred for each marketing activity. It would also compare marketing costs incurred by different actors in the channel of distribution. These are discussed with respect to farmers, traders and processors in the following sections.

4.3.2.1 Marketing cost and margin of farmers

Marketing costs of farmers included the cost of production, storage, loss due to damage, cost of empty bags, labor cost and cost incurred in transportation. The summary of the variable costs and the market margin for farmers are given in Table 13. The results indicate that farmers received a market margin of 83.62Tshs/kg and incurred a cost of 40 320 Tshs on average. However, despite a positive margin received by the famers, these farmers are still not benefiting from Jatropha production. This might be led by factors such as lower selling prices compared to the total costs that are incurred during farming activities, which therefore; reduces the total returns earned.

Table 13: Marketing cost and margin of farmers

Item (Tshs)	**Jatropha production (n=80)**	
	Total price (Tshs)	**Average amount/unit**
Variable costs		40 320
Buying price (Bp)	14 560	182
Selling price (Sp)	21 250	265.62
Market Margin (MM)	6690	83.62

Note*: AVC=is given in Tshs, Bp and Sp are given as Tshs/kg, MM=Tshs/kg*

4.3.2.2 Marketing cost and margin of traders

The marketing cost and margin for traders in the study area are summarized in Table 14. On average, the total marketing cost of the Jatropha traders was 97 662 Tshs. The main costs covered by the traders included storage costs, loss due to damage, cost of empty bags, labor/wage cost and transportation cost. The market margin for the traders was 302Tshs/kg. The results show that the traders bought Jatropha seeds from the farmers at a lower price compared to the price set by the farmers. This might be one of the reason which justifies that majority of the agricultural farmers in Tanzania in a monopolistic market are still not price setters. Moreover, the marketing costs of the traders were higher compared to those of the farmers.

4.4.2.3 Marketing cost and margin of processors

The most important costs covered by the processers included the expelling service fees (processing cost), production cost of soaps, labour and transportation cost (Table 15). On average, the total marketing cost for processors were 2 279 500 Tshs. Results obtained show that the market margins of the processors for oil/fuel, soaps, and fertilizer were 250Tshs/litre, 500Tshs/piece and 500Tshs/kg respectively.

Table 14: Marketing cost and margin of traders

Item (Tshs)	**Jatropha marketing (n=25)**	
	Total price (Tshs)	**Average amount/unit**
Variable costs		97 662
Buying price (Bp)	5250	210
Selling price (Sp)	12 800	512

Market Margin (MM)	7550	302

Note*: AVC=is given in Tshs, Bp and SP are given as Tshs/kg, MM=Tshs/kg*

Table 15: Marketing cost and margin of processors

Cost item (Tshs/unit)	**Jatropha processing (n=5) Average cost/unit (Tshs/ltr/pc/kg)**
Average Variable Costs (AVC)	2 279 500
Buying price (oil)	3500
Selling price (oil)	3750
Market Margin(1)	250
Buying price (soaps)	500
Selling price (soaps)	1000
Market Margin(2)	500
Buying price (fertilizer)	2500
Selling price (fertilizer)	3000
Market Margin(3)	500
Market Margin pr (1+2+3)	1250
Consumer price (oil)	3750
Consumer price (soaps)	1000
Consumer price (fertilizer)	3000

Note*: AVC=is given in Tshs, Bp fertilizer and Sp fertilizer are given in Tshs/kg, Bp oil and Sp oil are given in Tshs/litre, Bp soaps and Sp soaps are given in Tshs/piece.*

The overall margin was 1 250 Tshs. Jatropha processors seemed to have received a higher market margin compared to other actors in the Jatropha market chain. Consumer prices for different Jatropha products are also shown in the Table 15.

According to the results in Table 15, it is clear that the market margin for processors was higher compared to the rest ranging from 250 to 500 Tshs. Farmers seemed to have received lower market margin (83.62Tshs/kg) compared to the rest. Selling and buying prices were used to calculate the market margins for the farmers, traders and processors. The high market margin reflects less income for the farmer and more benefit for the other market functionaries. This therefore, brings a justification as to why the Tanzanian Government should intervene in order to facilitate the actors especially Jatropha farmers to increase production and productivity of Jatropha per

unit area of land, since it is a better alternative to increase marketable supply of Jatropha produces and increase their income. Introduction of improved varieties, application of chemical fertilizers, use of modern technologies, controlling disease and use of pesticides should be promoted to increase Jatropha production.

4.3.3 Interface pricing efficiency analysis

A simple regression analysis was done in order to find the correlation between market margin, buying and selling prices. The interface pricing efficiency model (Schmidt, 1979) was used for this particular analysis so as to determine whether or not price changes were passed onto the next market level i.e. the perfect market transparency. This approach was also used by Gabagambi (1998) in his study of rice marketing in Ulanga District.

The analysis was carried out to find the extent to which selling price, buying price and market margin are correlated to each other from farmers and traders. The analysis was performed and the results are presented in Table 16. Positive correlation coefficient between marketing margin and selling prices at various levels suggest that as selling price increase at one level, marketing margins increases as well. Results indicate that selling and buying prices at the farmers' level were highly correlated with each other ($r > 0.713$; $p=0.01$). At the traders' level it is observed that there was a correlation between the selling prices and the market margin ($r > 0.941$; $p=0.01$) and ($r>-.346$; $p=0.05$). The findings indicate that buying and selling prices at farmers' level were highly correlated with one another. The positive correlation coefficient between marketing margin and selling price implies that as selling price increases at the farmer' level, marketing margin increases as well. This suggests that

price changes are being passed on the subsequent channel level, hence the hypothesis stated to test whether or not price changes were passed on to the other market levels is accepted.

Table 16: Farmers and traders: correlation between market margin, buying price and selling prices.

Level	Margin(f)	Selling price(f)	Buying price(f)
Margin(f)		0.615**	-0.114
Selling price(f)			0.713**
Buying price(f)			
Level			
Margin(t)		0.941**	-0.346*
Selling price(t)			-0.007
Buying price(t)			

Note: **Correlation is significant at 0.05 levels (1-tailed), **Correlation is significant at 0.01 levels (1-tailed), f and t represent farmers and traders level*

On the contrary, the results show that there was a negative correlation between market margin, selling and buying prices at the traders' level. Obviously this implies that at the trader's level both selling and buying prices were fluctuating resulting in unstable market equilibrium. Moreover, low prices obtained by the farmers imply that farmers have less bargaining power compared to traders who take substantial portion of the final prices as profit for their services. In order for any agricultural undertaking activity to operate efficiently, incentives prices and adequate supply are of great importance. The Jatropha marketing system is still therefore inefficient in Tanzania.

4.3.4 Price transmission for Jatropha products

Price transmission was analyzed by calculating the market shares of the actors involved in the market chain. Table 17 shows the average shares received by various market actors in the study area. The results indicate that among all Jatropha market actors, processors enjoyed the largest share of about 43% of the ultimate consumer price. Traders seemed to have received the least share of only 21%. From these results one could interpret this as being a threat to traders. However, the in-field observation revealed that most traders were enjoying better off compared to farmers because they sell Jatropha produces more frequently and at higher prices compared to the farmers who sell their produces at a relative lower selling prices. Farmers received an average share of 35% of the ultimate consumer price. An implication of these results with respect to welfare distribution is as follows: it is shown that the welfare is distributed from agents downstream to agents upstream (presumably farmers to companies). This means that there is still a gap for the farmers and traders to get out of poverty since they are still receiving lower returns and shares to allow them become better-off. The following are the calculation results showing percentage market shares of the ultimate consumer price received by each of the Jatropha market participant.

Producer's share

$$PS = \frac{\frac{Px}{RP}}{\Sigma[1 - \frac{MM}{RP}]k\ 100} = [1-(83.62/265.63)*100]/193.44=35.42\% \quad (10)$$

Trader's share

$$TS = \frac{\frac{Px}{RP}}{\Sigma\left[1 - \frac{MM}{RP}\right] x\ 100}$$ = [1-(302/512)*100]/193.44=21.21%..... (11)

Processor's share

$$PRS = \frac{\frac{PRx}{RP}}{\Sigma\left[1 - \frac{MM}{RP}\right] x\ 100}$$ = [1-(1250/7750) x 100]/193.44 = 43.37%..... (11)

Table 17: Average market shares received by various market participants

Market participant	AVC	ASP	MM	Average share (Sum)	Percent (%)
Producers	40 320	265.63	83.62	68.52	35.42
Traders	97 662	512	302	41.02	21.21
Processors	2 279 500	7750	250	83.9	43.37
Overall	2 417 482	8527.63	1635.62	193.44	100

Note: *ASP, AVC, MM stand for Average selling price, Average variable cost and Market Margin respectively.*

4.4 Socio-economic characteristics of respondents

4.4.1 Age of respondents

Regnard (2006) urges that the total accumulation of wealthy is highly dependent on age of an individual, whereby a direct relationship is experienced. Likewise, age determines individual maturity and ability to make rational decisions. Moreover, Mlambiti, (1994) shows that age structure can be used to facilitate an understanding about labour potential of a specific population. Results in Table 18 give a summary of average ages for Jatropha farmers and traders interviewed. Farmers across the study area were middle aged ranging between 26-55 years with an average of 46 years of age. This means that majority of Jatropha farmers were within the working

age group. This brings an implication on the roles and responsibilities in the society in terms of Jatropha production and marketing throughout the year. The mean age of traders was 41 years and about 80% of traders' age was ranging from 26 to 55 years, implying that Jatropha marketing along the market chain is performed by the economically active group in the population.

Table 18: Age of the respondents

Statistics	Farmers (80)	Traders (25)	Total (80)
Average age	46	41	43.5
Age group	**Percent (%) distribution within the group**		
18- 25	14	20	8.5
26 –55	75	80	74.6
Above 56	11		16.9

4.4.2 Education level of respondents

Existing literatures show that education contributed 50% of variation in the total agricultural output in Tanzania (Amani *et al*., 1989). Table 19 gives a summary of education levels of the Jatropha market participants interviewed. Results show that majority of farmers (65%) have acquired primary education. This implies that Jatropha farmers in the study area have a modest basic knowledge that can be used to improve production of Jatropha which does not require much agronomic skills since it is a perennial crop that is self caring (Ohler, 1979). Moreover, results indicate that majority of the traders (56%) have acquired primary education. This implies that traders in the study area have a basic knowledge that can be used to improve agricultural marketing for Jatropha. This literacy level of the traders is encouraging because it has an influence on carrying out basic marketing activities at optimal level. However, Jatropha marketing has still remained underdeveloped in these areas. It is also shown that large populations (80%) of the respondents from the companies

have acquired degree. This gives an indication that most of the companies are controlled by people who were well trained both formally and informally. It is also depicted that majority of the consumers (55%) have acquired secondary education. These results imply that most of the respondents who acquired secondary education were mostly willing to pay for Jatropha products. This also justifies that awareness of Jatropha products to people is still low, as in majority of people do not either know the existence of Jatropha or the applications of it in terms of products usage.

Table 19: Education level of the respondents

Education level	Farmers		Traders		Co. respondents		Consumers	
	n	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Informal	21	26	6	24	0	0	0	0
Primary	53	66	14	56	0	0	3	15
Secondary	6	8	5	20	0	0	11	55
Certificate	0	0	0	0	0	0	2	10
Diploma	0	0	0	0	1	20	3	15
Degree	0	0	0	0	4	80	1	5
Total	**80**	**100**	**25**	**100**	**5**	**100**	**20**	**100**

4.4.3 Gender of respondents

As shown in Table 20, both men and women were Jatropha seeds producers. Men accounted for about 68%. This is probably because, in most poor to average income Tanzanians' families, men are in charge of family activities involving cash transactions while women are in charge of taking care of their homes and children and therefore, spending most of the times at home. In addition, access to capital might be another reason for this pattern since women especially in developing countries, do not have access to means of production and support services such as credit as compared to men. Another reason could be that in the Masaai communities

normally men are the heads of their families as well as owners of the production resources like capital and land. This is the common phenomena in African traditional societies (Misana, 1995). Moreover, 52% of the traders were women. The reason behind this observation could be that women were the main participants of the trading activities in their villages. That is, women play a greater role in trading activities since majority of men in masaai societies were particularly engaged in livestock keeping and farming while women performed other activities as household keeping and business. Results also indicate over fifty percent (60%) of the workers from Company were men. Consumers of the Jatropha products were equally distributed; this means both men and women accounted for about 50%.

Table 20: Gender of the respondents

Variable category		Farmers (n=80)		Traders (n=25)		Processors (n=5)		Consumers (n=20)	
		n	%	n	%	n	%	n	%
Sex	Male	54	68	12	48	3	60	10	50
	Female	26	32	13	52	2	40	10	50

4.4.4 Main source of income

Most of the interviewed farmers (68%) were involved in other income generating activities such as farming and livestock keeping. The reason for diversification is probably that Jatropha marketing is still an emerging market and cannot be relied upon as a sole source of income to cater for the basic needs during the whole year. Results also indicate that 44% of the traders earned income from both business and farming activities implying that Jatropha traders also diversified their main source of income generation (Table 21).

Table 21: Main income sources of respondents.

Activity	Farmers		Traders	
	n	%	n	%
Farming activities	4	5	10	40
Livestock keeping	0	0	3	12
Business activities	0	0	1	4
Farming & business activities	8	10	11	44
Farming & livestock keeping	54	68	0	0
Farming, livestock keeping & business activities	14	18	0	0

4.4.5 Housing structure of respondents

The study results identified that 87.5% of the farmers were living in simple mud walls with thatched roofing houses while only 12.5% of the respondents lived in consolidated mud walls with iron sheet roofing. None of the respondents lived in the brick walls tiled or iron sheet roofing (Table 22). Therefore, majority of farmers in the study area were still living under poor settlement reflecting a low level of income from their Jatropha production activities.

Table 22: Housing structure of the farmers.

House structure	Frequency	Percent
Brick walls tiled or iron sheet roofing	0	0
Consolidated mud walls with iron sheet roofing	10	12.5
Simple mud wall with thatched	70	87.5

roofing		
Total	80	100

4.4.6 Description of Jatropha production and marketing system in the study area

4.4.6.1 Jatropha production

Jatropha producers in the study area were not different from the producers of other crops such as maize. Majority of them diversified production so as to allow economies of scale i.e. planting other crops apart from Jatropha on the same field. Results show that about 98.8% of the Jatropha farmers reported that they grow other crops such as maize, dolicos lablab (locally called *ngwara* or *fiwi*), bananas, vegetables, beans, and cowpeas on the same field areas another field around their respective villages. None of these farmers rented a farm for Jatropha production. During focus group discussion with the Diligent Company, it was reported that most smallholders are often too poor to purchase fertilizers and they use it occasionally if they have financial means. In the cultivated fields, maize and beans were grown without nutrient inputs. Few crop residues remain on the fields and are incorporated into the soil but often complete residue removal for fodder and fuel. However, this contributes to the depletion of soil organic carbon. The results from Fig.5 show other crops grown by the farmers apart from Jatropha. Major reasons reported by theses farmers for growing more than one crop were to earn more income and to ensure food security for their families since Jatropha is not a food crop but rather a commercial crop.

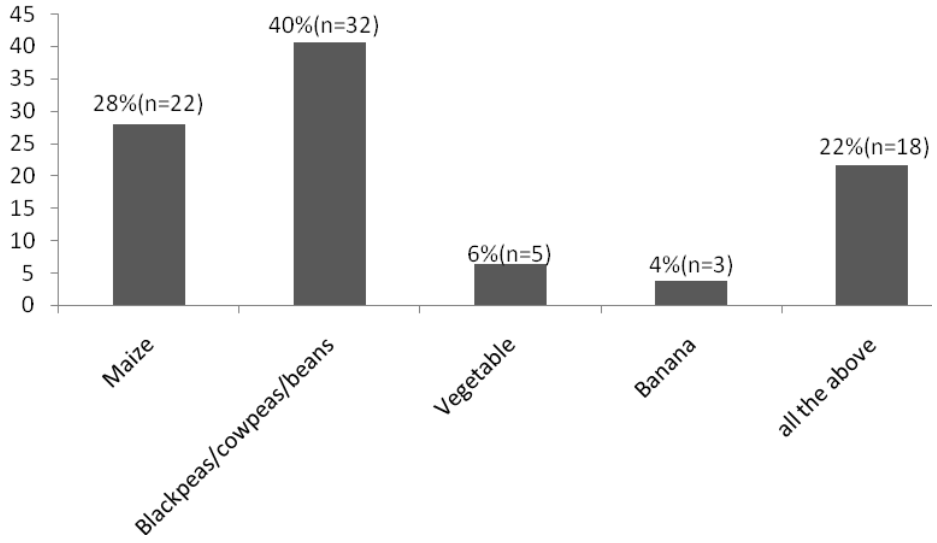

Figure 5: Other crops grown by the farmers

4.4.6.2 Production constraints

The main production constraints facing Jatropha farmers are shown in Fig.6**.** The results indicate that majority of Jatropha farmers (58%) reported the most prominent challenges facing them included pests and diseases, lack of farming skills, drought and shortage of farm inputs.

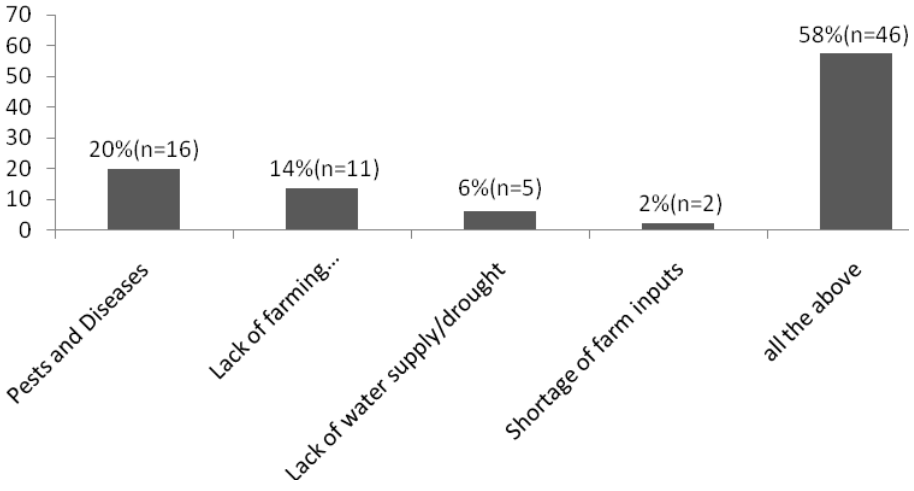

Figure 6: Main production constraints facing Jatropha farmers

4.4.6.3 Jatropha marketing

The results for market supply of Jatropha seeds in the study area show that the majority of farmers (87%) did not sell Jatropha seeds throughout the year. This observation could be due to reasons that majority of farmers were still facing production problems such as pests and diseases, lack of farming skills, training and extension services, lack of reliable water supply and shortage of farm inputs which limit Jatropha production and therefore, limits the availability of enough seeds to sell throughout the year. Traders were affected in one way or another by the nature of the market supply for Jatropha seeds. Further evidence is given by the results in Fig. 7 that many traders were forced to sell other crops apart from Jatropha seeds because they could not just rely on it as their sole marketing crop because its availability was seasonal. The results indicate that the majority of traders (68%) did not just sell Jatropha seeds but also other crops such as maize, dolicos lablab (locally known as *ngwara* or *fiwi*), bananas, beans and vegetable. Maize (32%) and dolicos lablab (40%) farming was reported to be dominant grown basically due to their socio-economic role in terms of food security for the household.

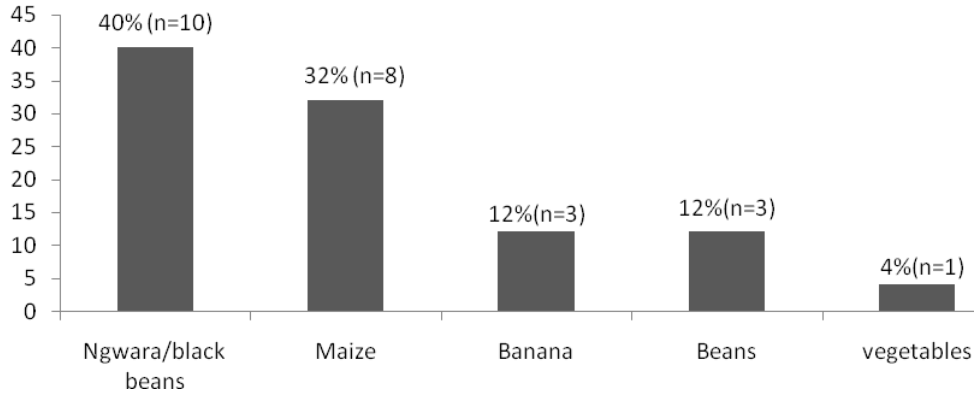

Figure 7: Percent of traders selling other crops apart from Jatropha

4.4.6.4 Marketing constraints

The main marketing problems facing Jatropha traders and processors while selling the Jatropha seeds are shown in Table 23. The results indicate that transportation barriers, shortage of seeds/seasonal supply of seeds, low selling prices and limited markets accounted for 52% of the marketing constraints experienced by the Jatropha traders while low availability of Jatropha seeds, low technology used in processing, pricing problems, promotion and distribution problems, lack of market and marketing skills accounted for 80% of the marketing problems faced by Jatropha seed processors.

Table 23: Main marketing problems facing Jatropha traders and processors

Constraints	Frequency	Percent
For traders		
Transportation problems	3	12
Shortage of seeds/seasonal supply of seeds	3	12
Low selling price	4	16
Limited market	2	8
All the above	13	52
Total	**25**	**100**
For processors		
Promotion and distribution problems	1	20
All the above	4	80
Total	**5**	**100**

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

The main objective of the study was to analyze the market efficiency for Jatropha in Monduli and Arumeru Districts. Moreover, the study intended to achieve the following specific objectives: (i) to assess the Jatropha marketing channels and marketing power among actors, (ii) to determine the pricing efficiency of the Jatropha marketing chain, (iii) to analyse the market margins and gross margins of the Jatropha farmers, traders and processors and (iv) to analyse the price transmissions from the producer to ultimate consumption and utilization. Both secondary and primary data were collected for the study. This chapter presents the conclusions and recommendations emerging from the major findings of the study.

5.1 Conclusions

The study revealed that the existing Jatropha market channels involved a number of channels and not just one single channel. The Jatropha market channels are limited to farmers, traders (wholesalers and retailers), Jatropha processors and ultimately to consumers. Tendency of small number of consumers' preference on purchasing Jatropha products might be one of the reasons that make Jatropha farmers unconcentrated. The Jatropha marketing for traders is non- competitive due to the existence of a weak oligopolistic market structure.

Buying and selling prices at the producers' level were highly correlated with one another. The positive correlation coefficient between marketing margin and selling

price indicate that as selling price increases at the farmers' level, marketing margin increases as well. On the contrary, there was a negative correlation between market margin, selling and buying prices at the traders' level. Obviously this implies that at the trader's level both selling and buying prices were fluctuating resulting in unstable market equilibrium. Low prices obtained by the producers suggests that they have less bargaining power compared to traders who take substantial portion of the final prices as profit for their services. In order for any agricultural undertaking activity to operate efficiently, incentive prices and adequate supply are of great importance. The Jatropha marketing system is still therefore inefficient in Tanzania.

Processors were found to earn higher gross margins compared to Jatropha farmers and traders. Processors also received a large share of the final consumer price compared to the farmers and traders. However, Jatropha traders seemed to have higher market margins compared to the farmers. Farmers have been found to accept low prices because of factors such as lack of awareness of the prevailing market prices, lack of cash, or means to efficiently transport their produce to the markets. Furthermore, processors incurred higher costs compared to farmers and traders. Generally, the Jatropha marketing is still inefficient.

The most prominent constraints facing the Jatropha farmers included pests and diseases, unreliable rainfall, lack of farming skills, training and extension services for Jatropha production and the shortage of farming inputs. These problems reduced production and prevented the realization of potential income gained by Jatropha farmers. Traders and processors faced the following marketing problems: high

transportation costs, low selling prices, limited markets, low technology for processing, promotion and distribution problems and lack of markets and marketing skills.

From above findings, this study indicates clearly that Jatropha production and marketing are potentially profitable activities, not only to the actors' perspective but also in the environment basis. However, it is evident that these actors especially the farmers and traders in the study areas have not yet received full potential benefits of producing and marketing Jatropha produces. Marketing arrangements in terms of prices arrangement also do not provide adequate satisfaction to Jatropha farmers, traders and processors. Therefore, immediate measures on how to solve these problems should be undertaken so as to enable the Jatropha market chain to be efficient and profitable to all the actors especially the farmers who are the backbone of the whole system.

5.2 Recommendations

Based on the results of the study, the following are the recommendations and policy implications directed towards improving the performance of the Jatropha production and marketing.

5.2.1 Strengthening and promoting groups of actors in the Jatropha marketing

Efficient coordination of this Jatropha value chain is critical. The integration can be realized if deliberate efforts are made to have a well coordinated information flow on proper Jatropha production and marketing methods and a targeted training of actors

including consumers. The establishment of well coordinated and organized Jatropha marketing will bring development in the energy sector as well as increase income and provide employment for the majority. A variety of approaches are possible and it would be important to explore and introduce potential interventions such as formation of cooperatives and marketing groups. Such kind of associations and groups are usually influential in provision of information and influencing price formation. They will also provide a forum for training, networking and organizing marketing of Jatropha in the country as a whole. Furthermore, knowledge on good agronomic practices, storage systems, market activities, group-formations and credits accessibility should be imparted to the chain actors. The provision of extension services can help to improve market participation among the Jatropha actors. The Government should also seek for a possibility of promoting farm-level processing of Jatropha seeds to enable forward linkage of farmers in value addition-hence more benefits.

5.2.2 Formulation of policies guiding Jatropha marketing

The policy implication in this aspect is for the government to formulate a policy to stimulate local markets for the Jatropha products and exportation of surplus products. The government also needs to develop a policy that restricts monopolization of the development of Jatropha activities in order to develop a fair balance of demand and supply and ensure biofuel development ‘by local people for local people’ in a sustainable manner. Another policy implication is for the government to facilitate the development of many demonstration sites that use Jatropha oil as a fuel for road transport. Moreover, public and private sector partners to promote Jatropha industry are needed. The promotional activities might include seminars, conferences and

Jatropha uses demonstrations in a massive way to create customer, producer and other stakeholders' awareness. There is a need to have an institutional framework to guide Jatropha contracts or to develop a contractual model to help rural dwellers when signing contracts with Jatropha private investors. Implementing all these will therefore provide an efficient Jatropha market system in the country.

5.2.3 Strengthening the pricing behaviours and market information system

Generally the traders are capable of sourcing reliable price and buyer information from different sources whereas farmers rely on other farmers and government extension staff for the same information. There is therefore a great need to make market information available to farmers at the right time and place. In response to this challenge, it is good to develop an integrated agricultural marketing information system that will be linked to Jatropha traders and processors and finally to the Government Biofuel Task Force which is connected to the energy sector.

5.2.4 Intervention to increase Jatropha production and productivity

The quantity of Jatropha produced at the farm level tends to affect the market supply of Jatropha produces positively and significantly. However, farmers are still working under limited plots of land without using improved technologies and inputs. Jatropha producers in the study areas used limited inputs (like improved seeds, pesticides and insecticides and modern technologies) or in some cases not any at all. Hence, increasing production and productivity of Jatropha seeds as per unit area of land are better alternatives to increase marketable supply of Jatropha produce. Application of fertilizers, controlling pests and disease practices should be encouraged so as to increase Jatropha production. Availability of enough seeds will also allow other

actors in the chain such as processors to increase production of other outputs such as fuel or oil, soaps and fertilizers which are of use to many consumers. Jatropha processors should also be provided with modern machines for processing the Jatropha seeds so as to allow extraction of a high quality products i.e. fuel or oil consistently in order to meet the requirements of energy demand not only at the national level but also at the international level.

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APPENDICES

Appendix 1: Gross margins for Jatropha farmers and traders

Description	**Sales/Costs Percent (Tshs)**	**(%)**	**Sales/Costs Percent (Tshs)**	**(%)**
	Farmers GM		Traders GM	
Average yield (kgs)	192.9375		268.72	
Average price (Tshs/kg)	265.625		502	
Average revenue (Tshs)	51249.02		134897.44	
Less				
Averagevariablecost(Tshs)	40 320		97 662	
AGM	10929.02	21.3	37235.44	27.6

Note*: GM is given as (Tshs/kg) and AGM= Average gross margin*

Appendix 2: Gross margins for Jatropha processors.

Activity(Sale/Cost)	Quantity/unit		Selling price (Tshs)	Average amount(Tshs/kg/lrts/ pcs)
Average sale of seedcake (1)	361.56	Kgs	3000	1 084 680
Average sale of Jatropha oil/fuel (2)	162	Ltrs	3750	609 150
Average sale of Jatropha soaps (3)	1949	Pcs	1000	1 949 280
Sale of Jatropha seeds/seedlings to farmers (4)	1550	Kgs	250	387 500
Average expelling service charge/fee (5)				1 100 000
Average production cost of soaps (6)				419 500
Average transport charges + labor fees (7)				760 000
Average sale (1+2+3+4)				3 643 110
Average variable cost (5+6+7)				2 279 500
AGMpr				1363610 (37.42%)

Note*: AGMpr= Average gross margin for processors; ltrs=litres, pcs=pieces*
Average quantity of the seeds bought by the processors is 524kgJCL seeds,
0.69 of JCL seed content is cake, 0.31 of JCL seed content is oil

Appendix 3: FARMERS QUESTIONNAIRE

General information

Questionnaire no. … ……Date of interview…….. ……..

Interviewer's name……Farmer's name ……

Division…….Ward ……

Village……

SECTION 1: FARMER'S CHARACTERISTICS (Fill the gap or circle one)

1.1 Respondent's name…….

1.2 Gender i) Male ii) Female

1.3 Age i) under 18 years ii) Between 18-25 years iii) Between 26-55 years iv) Above 56 years.

1.4 Marital status i) Single ii) Married iii) Widow(er) iv) Divorced/Separated

1.5 Education level i) No formal schooling ii) Adult literacy classes iii) Primary school

iv) Secondary school v) Certificate vi) Diploma vii) Degree

1.6 Age of household head……(years)

1.7 Gender of the household head i) Male ii) Female

1.8 What is your household size? i) Adults……

ii) Children…….

1.9 Type of shelter owned by respondent (*if more than one, please characterize the main building*) i) Brick walls, tiled or iron sheet roofing ii) Consolidated mud walls, with iron-sheet roofing iii)Simple mud walls with thatched roofing iv) Others……..

1.10 List your main sources of income

i)…….ii)…….iii)……

…….iv)…….v)……

vi)……..

1.11 List your most important/main occupation?

i)…….ii)…….iii)……

1.12 Why do you cultivate Jatropha?

i) Hedge/Fence ii) Own energy supply iii) Rehabilitating degraded land iv) Commercialization so as to diversify income sources

1.13 Do you grow other crops apart from Jatropha? i) Yes ii) No

If **yes** list the crops

i)…….ii)…….iii)……

……

1.14 How much land do you own and/or rent?

Description	Size(area)	Value (Tshs/area)
Owned land		
Rented land		
Others		

1.15 What is the total size of your farmland under agriculture (size in acres)? .....

1.16 How much income did you get from selling livestock products this season?.....(Tshs)

SECTION 2: OBJECTIVE #1

Identification of the marketing and distribution channel of Jatropha products including marketing power among marketing actors.

- **Marketing and distribution channel of Jatropha products**

2.1 Who are the major buyers of your seeds?

i)…… ii)…… iii)…….

2.2 Where do you normally meet your buyers?

i) At home ii) At the field/farm iii) At the market iv) Others (specify)……

2.3 Are they the only buyers of your seeds? i) Yes ii) No

2.4 List the reasons for selling to them most of your seeds relative to others? i) Better price ii) Only buyer available iii) Market convenient iv) Others (specify)……

2.5 Do you supply Jatropha seeds throughout the year? i) Yes ii) No

2.6 If yes to qn. 2.4, which months in a year there is a high demand of Jatropha seeds?

2.7 What is the peak month(s) of Jatropha seeds production? .....

2.8 Do you normally have enough seeds to meet demand? i) Yes ii) No

2.9 If **no** to qn. 2.7, how do you ensure constant supply of Jatropha seeds?.....

Challenges hampering the facilitation of Jatropha flow

2.9 What are the major challenges facing Jatropha seeds production?

i……..

ii ……..

iii ……..

iv ……..

2.10 What should be done to improve Jatropha seeds production?

i …….

ii …….

2.11 What are the major challenges facing Jatropha seeds marketing?

i……..

ii ……..

2.12 What should be done to improve Jatropha seeds marketing?

i …….

ii …….

iii

Concentration ratio to assess the market power of the farmers

2.13 What is the total quantity (kg/bags) of Jatropha seed is purchased by big buyers along the chain? .....

2.14 What is the total quantity (kg/bags) of Jatropha seeds did you produce in this production season? .....

2.15 What is the total quantity (kg/bags) of Jatropha seeds did you sell in this marketing season? .....

SECTION 3: OBJECTIVE #2

Analysis of marketing efficiency in performing different operations in the chain in terms of pricing and margins obtained by different actors

Marketing and Gross margins of Jatropha seeds farmers

3.1 Revenue and operational cost of Jatropha seeds production

Particulars (Tshs)	Units	Price/unit	Average price/kgs	Remarks
Buying price (Bp)				
Selling price (Sp)				
Marketing margin (MM)				
Operational Cost				
Production costs				
Land preparation Seedlings Planting Harvesting Winnowing				
Storage infrastructure cost (if hired)				
Loss due damage				
Cost of bags, string any protective materials (if any)				
Transport cost				
Taxes				
Insurance cost (if incurred)				
Other operational cost (specify)				
Total operational costs				
Gross Margin (GM)				

3.2 Do you have access to any market information? i) Yes ii) No

3.3 if **yes** to qn. 3.2 list the type of information to you access/get?

i)…….. ii)…….

iii)……. iv)…….

3.4 Where do you get market information? i) From traders ii) From neighbors iii) From friends and relatives iv) Radio broadcasting v) Magazines vi) Others (specify)
3.5 How do you access this information? i) By physical visit ii) By using telephone iii) By asking traders who come to buy iv) By listening to radios and watching televisions v) Others (specify)……
3.6 Do you incur any cost to acquire that information? i) Yes ii) No
3.7 If **yes** to qn 3.6, how much (Tshs)? .....
3.8 What strategies do you set to have always this information on time?
i)……. ii)……..

iii)……. iv)……..

3.9 What kind of marketing costs do you incur on marketing your Jatropha seeds?

Type of cost	Unit	Tshs/unit
Transportation		
Taxes		
Processing		
Labor charges		
Market fee		
Others		
Total costs		

3.10 Do you face any market competition from other farmers in doing your marketing activities?
i) Yes ii) No
3.11 If **yes,** how strong is the degree of competition? i) Very strong ii) Strong iii) Moderate/Normal
3.12 How many farmers (roughly) are doing the same activities as the one you are doing?
i) Less than 50farmers ii) 50-100 farmers iii) More than 100 farmers
3.13 Did you face any problem/barriers before you entered/doing this kind of business/marketing of Jatropha seeds? i) Yes ii) No
3.14 If **yes** to qn 3.12, what where the main barriers to entry?
i)…….. ….. iii)……..
3.15 Do you differentiate your product? i) Yes ii) No
3.16 If **yes** to qn.3.14, what criteria do you use to differentiate your products?
i)…….. iii)……..
ii)…….
3.17 Are you able to respond to any market opportunities? i) Yes ii) No
3.18 If **yes** to qn 3.17; what kind of the market opportunities are you able to acquire?
i) The use of technology on production and marketing
ii) Others (specify)……..

SECTION 5: ASSETS, OFF FARM ACTIVITIES AND ENERGY SECURITY

Assets

5.1 Which of the following items does your household own? *(Multiple answers possible)*

i) Car □Plough □Mobile phone
ii) Tractor □Television □Water tank
ii) Motor cycle □Satellite dish □Bicycle
iv) Radio □Solar panel/dish

**Please specify others:* _____

5.1 Do you have the following financial assets?

i) Support from children (e.g. in town or abroad) ii) Savings iii) Money from credits

Off-farm activities

5. 3 Do you have any of the following sources of off-farm income?

Source of income	Frequency /yr	Income (Local currency per period)	Comment
Salary from employment			
Salary from business			
Salary as agricultural worker			
Salary from public work	.		
Remittances from family/ friends			
Income from sale of charcoal			
Income from renting land			
Other (Specify):			

Energy security

5.4 Please rank these energy sources according to their importance for your household?

(rank no 1-7= very important-decreasing importance, Write 0 if not. used)

i) Jatrophaoil ii) Jatrophadiesel iii) Kerosene iv) Diesel/Petrol

v) Firewood vi) Charcoal vii) Electricity viii) Other (please specify):_____

5.5 Could energy from Jatropha in your opinion play a role to cover the local energy needs?
i) Yes* ii) No*

**Why do you think so?* _____

Thank you for your cooperation

Appendix 4: Traders questionnaire

General information

Questionnaire no. … ……Date of interview…….. ……..

Interviewer's name……Trader's name ……

Division……Ward name……

Village/town……

SECTION 1: TRADER'S CHARACTERISTICS (fill the gap or circle one)

1.1 Respondent's name…….

1.2 Gender of the respondent i) Male ii) Female

1.3 Age of the respondent i) under 18 years ii) Between 18-25 years old iii) Between 26-55 years old iv) Above 55 years old.

1.4 Marital status of the respondent i) Single ii) Married iii) Widow(er) iv) Divorced/Separated

1.5 Education level of the respondents i) No formal schooling ii) Adult literacy classes iii) Primary school iv) Secondary school v) Certificate vi) Diploma vii) Degree

1.6 Age of household head……(years)

1.7 Gender of the household head i) Male ii) Female

1.8 What is your household size? i) Adults……

ii) Children…….

1.9 List your main sources of income

i)…….ii)…….iii)……

1.10 List your most important/main occupation?

i)…….ii)…….iii)……

1.11 How much income did you get from doing Jatropha seed marketing this season? (Tshs)

SECTION 2: OBJECTIVE #1

Identification of the marketing and distribution channel of Jatropha products including marketing power among marketing actors.

- **Marketing and distribution channel of Jatropha products**

2.1 Type of trader i) Wholesaler ii) Retailer iii) Other (specify)……

2.2 Years in business i) Below one year ii) One year iii) Two years iv) Three years v) Above three years

2.3 Who are your major customers/buyers?

i)……

ii)……

2.4 Which months the Jatropha seeds are sold mostly? .....

2.5 Why the seeds are sold mostly in such months? i) Cash demand increases ii) Accessibility of transport to the market iii) Customers demand increase iv) Other (specify)

2.6 Do you sell other crops/seeds apart from Jatropha? i) Yes ii) No

If yes list the crops

i)…….ii)…….iii)……
.

2.7 What are the major marketing constraints facing you?

i) ……..

ii) ……..

iii)……..

2.8 What should be done to improve Jatropha seeds marketing?

i) …….

ii) …….

iii) …….

Concentration ratio to assess the market power of the trader

2.9 What is the total quantity (kg/bags) Jatropha seed purchased by big buyers along the chain? ……..

2.10 What is the total quantity (kg/bags) of Jatropha seeds did you produce in this production season? .....

2.11 What is the total quantity (kg/bags) of Jatropha seeds did you sell in this marketing season? .....

SECTION 3: OBJECTIVE #2

Analysis of marketing efficiency in performing different operations in the chain in terms of pricing and margins obtained different actors

- **Marketing and Gross margins of Jatropha seed traders**

3.1 Revenue and operational cost of Jatropha seeds production

Particulars (Tshs)	Units	Price/unit	Average price/kgs	Remarks
Buying price (Bp)				
Selling price (Sp)				
Marketing margin (MM)				
Operational Cost				
Storage infrastructure cost (if hired)				

Loading and unloading				
Cost of bags, string any protective materials (if any)				
Transport cost				
Premises charges (if any)				
Labor/wage cost (if any)				
Taxes				
Other operational cost (specify)				
Total operational costs				
Gross Margin (GM)				

3.2 Do you have access to any market information? i)Yes ii) No

3.3 If**yes** to qn. 3.2 what type of information to you access/get? i) Price of inputs

Others (specify) i)…….. ii)…….

iii)……. iv)…….

3.4 Where do you get market information? i) From farmers ii) From neighbors iii) From friends and relatives iv) Radio broadcasting v) Magazines vi) Others (specify)
3.5 How do you access this information? **i**) By physical visit ii) By using telephone iii) By asking traders who come to buy iv) By listening to radios and watching televisions v) Others (specify)……
3.6 Do you incur any cost to acquire that information? i) Yes ii) No
3.7 If yes, how much (Tshs)? .....
3.8 What strategies do you set to have always this information on time?
i)……. ii)……..

iii)…….

3.9 Do you normally know the price in advance before taking your produce to the market? i)Yes ii) No. If yes how do you get price information? i) Visit to the farm place/market ii) From other traders iii) (Specify)……..

3.10 What is the normal paying condition in Jatropha marketing?

i) In advance ii) In cash iii) Exchange trade iv) Others (specify)……

3.11 What kind of marketing costs do you incur on marketing your Jatropha seeds?

Type of cost	Unit	Tshs/unit

Transportation		
Taxes		
Processing		
Labor charges		
Others		
Total costs		

3.12 Do you face any market competition from other traders in doing your marketing activities?
i) Yes ii)No
3.12 If yes, how strong is the degree of competition? i) Very strong ii) Strong iii) Moderate/Normal
3.13 How many traders (roughly) are doing the same activities as the one you are doing?
i) Less than 50 traders ii)50-100 traders iii)More than 100 traders
3.14 Did you face any problem/barriers before you entered/doing this kind of business/marketing of Jatropha seeds? i)Yes ii)No
3.15 If yes to qn 3.14, what where the main barriers to entry?
i)…….. ii)….. iii)……..
ii3.16 Do you differentiate your product? i) Yes ii) No
3.17 If yes to qn.3.16, what criteria do you use to differentiate your products?
i)… ii)..... iii)…….
3.18 Are you able to respond to any market opportunities? i)Yes ii)No
3.19 If yes to qn 3.18; what kind of the market opportunities are you able to acquire?
i) The use of technology marketing
ii)Others (specify)…….

Thank you for your cooperation

Appendix 5: Jatropha seed processors questionnaire

General information

Questionnaire no. … …….Date of interview…….. ……

Interviewer's name……Processor /Company name …..……

Division……Ward name……

Village/town……

SECTION 1: RESPONDENT CHARACTERISTICS (Fill the gap or circle one)

1.1 Respondent's name…….

1.2 Gender of the respondent i) Male ii)Female

1.3 Age of the respondent i) under 18 years ii) Between 18-25 years old iii) Between 26-55 years old iv)Above 55 years old.

1.4 Marital status of the respondent i) Single ii) Married iii)Widow(er) iv)Divorced/Separated

1.5 Education level of the respondents i) No formal schooling ii)Adult literacy classes iii) Primary school iv)Secondary school v)Certificate vi)Diploma viii) Degree

1.6 What is your household size? i) Adults…… ii) Children…….

SECTION 2: TRADING INFORMATION

2.1 Business head i)Male ii)Female

2.2 Experience in business i) Below one year ii) One year iii)Two years iv)Three years v) Above three years

2.3 What is a form of ownership of your processing company? i) Individual ii) Partnership iii) State/cooperative iv)Others (specify)……

2.4 How did you obtain the start-up capital? i) Own saving from other activities ii) Informal money lenders iii) Bank loan/SACCOS iv) Others (specify)…….

2.5 How much capital did you use to start this processing enterprise (in Tshs)?

i) Below 100,000 ii) Between 100,000-500,000 iii) Between 500,000-1,000,000 iv) above1,000,000

2.6 How frequently, do you operate the Jatropha seed processing? i)Full time ii) Part-time

2.7 a) Do you have any technical knowledge on Jatropha seed processing? i)Yes ii) No

b) If **yes,** how did you obtain the processing knowledge? i) Formal training ii) Informal training.

2.8 Have you registered your processing machine enterprise? i)Yes ii)No

If yes, when…….. (year)

2.9 Why is it important to register the company? .....

2.10 Did you obtain the license easily? i)Yes ii) No

If **no,** give reasons…….

2.11 How did the premises of your processing machine obtained? i) Rented ii)Bought

iii) Inherited.If hired, at what rent do you pay per month? ..... (Tshs)

SECTION 3: OBJECTIVE #1

Identification of the marketing and distribution channel of Jatropha products including marketing power among marketing actors.

Marketing and distribution channel of Jatropha products

2.12 What form of products do you produce from the Jatropha seeds?

i) Oil/fuel ii) Fertilizers iii) Soaps iv) Others (specify)……..

2.12 ho are your major customers/buyers?

i) Local consumers ii) Local traders iii) Interregional traders iv) Others (list)……

2.14 What kind of effort have you made to ensure the customers know your processing

machine? i) Advertisement posters ii)Location of machine is near high population area

iii)Informing friends/relatives iv)Others (list)……

2.15 Which months do processing mostly done? (Number the months in order of highest

operation).

J	F	M	A	M	J	J	A	S	O	N	D

2.16 Why processing is mostly operated in those months?

i) Availability of Jatropha seeds ii) Market convenient iii) Availability of many traders/Middlemen iv) Others (specify)……

2.17 Do you process other crops/seeds apart from Jatropha? i) Yes ii)No

If yes list the crops

i)…….ii)…….iii)……
2.18 What are the major marketing constraints facing you?

i)……..

ii)……

iii)……

2.19 What should be done to improve Jatropha seeds marketing?

i)……..

ii)……

iii)……

Concentration ratio to assess the market power of the processors

2.20 What is the total quantity (kg/bags) Jatropha seed purchased by big buyers along the chain? ……..

2.21 What is the total quantity (kg/bags) of Jatropha seeds did you process in this season? .....

2.22 What is the total quantity of the processed products did you sell in this marketing season? .....

SECTION 4: OBJECTIVE #2

Analysis of marketing efficiency in performing different operations in the chain in terms of pricing and margins obtained different actors

Marketing and Gross margins of Jatropha seed processors

4.1 Revenue and operational cost of Jatropha seeds

Particulars (Tshs)	Units	Price/unit	Average price/kgs	Remarks
Buying price (Bp)				
Selling price (Sp)				
Marketing margin (MM)				
Operational Cost				
Storage infrastructure cost (if hired)				
Loading and unloading				
Electricity bills				
Water bills				
Processing fees				
Labor/wage cost (if any)				
Taxes				
Other operational cost (specify)				
Total operational costs				
Income from by-products				
Gross Margin (GM)				

4.2 Do you have access to any market information? i)Yes ii)No

4.3 Ifyes to qn. 3.2 what type of information to you access/get? i) Price of inputs

ii) Others (specify) i)……..

ii)…….

iii)……. iv)…….

4.4 Where do you get market information? i)From farmers ii)From neighbors iii)From friends and relatives iv)Radio broadcasting v)Magazines vi) Others (specify)……
4.5 How do you access this information? i)By physical visit ii)By using telephone iii)By asking traders who come to buy iv)By listening to radios and watching televisions v) Others (specify)……
4.6 Do you incur any cost to acquire that information? i)Yes ii)No
4.7 If yes, how much (Tshs)? .....
4.8 What strategies do you set to have always this information on time?
i)……. ii)……..

iii)…….

4.9 Do you normally know the price in advance before selling your produce to the market?i)Yes ii) No. If **yes** how do you get price information? i) Visit to the farm place/market ii) From other traders iii) (Specify)……..

4.10 What is the normal paying condition in Jatropha marketing?

i) In advance ii) In cash iii) Exchange trade iv) Others (specify)……

4.11 What kind of marketing costs do you incur on marketing your Jatropha seeds?

Type of cost	Unit	Tshs/unit
Loading and unloading		
Taxes		
Processing		
Transport		
Labor charges		
Others		
Total costs		

4.12 Do you face any market competition from other companies/traders in doing your
marketing? i)Yes ii) No
4.12 If yes, how strong is the degree of competition? i) Very strong ii) Strong iii) Moderate/Normal
4.13 How many companies/traders (roughly) are doing the same activities as the one you aredoing? i)Less than 5 companies /traders ii) 6-10 companies / traders iii) More than 10 companies /traders
4.14 Did you face any problem/barriers before you entered/doing this kind of business?
i)Yes ii) No

4.15 If yes to qn 3.12, what where the main barriers to entry?
i)…….. ii)….. iii)……..
4.16 Do you differentiate your product? i) Yes ii) No
4.17 If **yes** to qn.3.14, what criteria do you use to differentiate your products?
i)…….. ii) iii)……..
4.18 Are you able to respond to any market opportunities? i)Yes ii) No
4.19 If **yes** to qn 3.17; what kind of the market opportunities are you able to acquire?
i)The use of technology marketing
ii) Others (specify)……..

Thank you for your cooperation

Appendix 6: Consumers questionnaire

General information

Questionnaire no. … ……Date of interview…….. ……..

Interviewer's name……Consumer's name …….

Division……Ward name……

Village/town……

SECTION 1: CONSUMER'S CHARACTERISTICS (Fill the gap or circle one)

2.13 Respondent's name…….

2.14 Gender i) Male ii) Female

2.15 Age i) under 18 years ii) Between 18-25 years old iii) Between 26-55 years old iv)Above 56 years old.

2.16 Marital status i) Single ii) Married iii) Widow(er) iv)Divorced/Separated

2.17 Education level i)No formal schooling ii) Adult literacy classes iii)Primary school iv)Secondary school v) Certificate vi) Diploma vii)Degree

2.18 Age of household head……(years)

2.19 Gender of the household head i) Male ii)Female

2.20 What is your household size? i) Adults…… ii) Children…….

2.21 List your main sources of income

i)…….ii)…….iii……..

2.22 List your most important/main occupation?

i)…….ii)…….iii)……

SECTION 2: OBJECTIVE #1

Identification of the marketing and distribution channel of Jatropha products including marketing power among marketing actors.

Marketing and distribution channel of Jatropha products

1.1 What form of Jatropha products do you buy?

i) Oil/fuel ii)Fertilizers iii) Soaps iv)Others (specify)…….

2.2 Who are your major seller(s) of your products?

i)…… ii)…… iii)…….

2.2 Where do you normally contact your sellers?

i) At home ii) At the field/farm iii) At the market iv) Others (specify)……

2.3 Why do you prefer to buy the Jatropha products?

i)……

ii)……..

iii)……

2.4 Do you buy Jatropha products throughout the year? i) Yes ii) No

2.5 If yes to qn. 2.4, which months in a year there is a high demand of Jatropha products? ……..

Challenges hampering the facilitation of Jatropha flow and its measures

2.6 What do you think are the major challenges facing Jatropha products marketing?

i)……..

ii)……..

2.7 What do you think should be done to improve Jatropha products marketing?

i)……..

ii)……..

SECTION 3: OBJECTIVE #2

Analysis of marketing efficiency in performing different operations in the chain in terms of pricing and margins obtained different actors

Marketing margins of consumers

3.1 Revenue and operational cost of Jatropha seeds

Particulars (Tshs)	Units	Price/unit	Average price/units	Remarks
End buying price (Bp)				
First selling price (Sp)				
Marketing margin (MM)				

Thank you for your cooperation