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WAGENINGEN

INTEGRATING THE DAIRY BUSINESS HUB MODEL IN A VALUE CHAIN DEVELOPMENT OF SMALL HOLDER DAIRY FARMERS

A CASE STUDY OF KEIYO DISTRICT

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DEDICATION

This research work is dedicated to my beloved parents who have taught me the importance of honesty, the significance of knowledge and the discipline of work, and to my beloved wife Beatrice Amoiti for her endurance shown in my absence, I love you and our five children.

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Equivalent: 1 euro = Ksh 104 (11th August, 2012)

1 litres of milk = 1 Kg of milk

ABBREVIATIONS

CDF	-	Constituency Development Fund
DBHM	-	Dairy Business Hub Model
DDC	-	District Development Committee
DIS	-	Dairy Information System
DLEO	-	Divisional Livestock Extension Officer
DLPO	-	District Livestock Production Officer
DMG	-	Dairy Management Group
EADDP	-	East Africa Dairy Development Programme
GDP	-	Gross Domestic Product
GOK	-	Government of Kenya
GM	-	Gross Margin
IT	-	Information Technology
ICT	-	Information Communication Technology
MCS	-	Metkei Cooperative Society
MMC	-	Metkei Multipurpose Company
NGO	-	Non-governmental Organization
NKCC	-	New Kenya Cooperative Creameries

EXECUTIVE SUMMARY

Dairy is one among the most important farm enterprise in both Keiyo North and Keiyo South district. In Keiyo North the enterprise has been marred with slow growth characterized by low milk yields, disoriented market, poor milk quality, insufficient credit and with limited investors. The small holder dairy farmers in the district experience fluctuating milk prices and with low yields averaging four litres per cow per day, they are unable to invest in dairy thus depending on cash for their sale which is not enough to fund their recurrent budget need. The farmers are not organized into groups and therefore sale milk individually which make them have limited bargaining power and cannot benefit from economies of scale.

The situation in Keiyo south was not quite different from Keiyo North in the past three years, but after the implementation of the Dairy Business Hub Model (DBHM) in 2010, the district has grown tremendously. This has been spearheaded by the East African Dairy Development programme that witnessed the establishment of Metkei Multipurpose Company (MMC) a central collecting point of milk for the dairy farmers for the purpose of bulking, chilling, quality control and marketing. The company has a current membership of over 6000 dairy farmers and collects on average 13,000 Kg of milk daily. Though there is marked dairy achievement in Keiyo South, its sister district Keiyo north has had a lackluster growth in the sub sector with a disoriented milk supply chain.

The study was carried out between 14th July 2012 to 18th August 2012 in the larger Keiyo district in both Keiyo North and Keiyo South districts with an objective of investigating the milk supply chain of Keiyo North district and exploring the role played by small holder dairy farmers in dairy hub business in the Keiyo South District in order to improve on the chain relationship among the actors in Keiyo North District. The study examined the current status of dairy sub sector in Keiyo North and compared it with the hub model of Keiyo south.

The result found out that the efficient working of a hub system is coordinated by business services delivered around the chilling plant which gives a more organized and close relationship among the actors of the chain, who are coordinated by Metkei Multipurpose Company with the main purpose of doing business with the dairy farmer. This was quite opposite to Keiyo North, which apart from having low milk production had a disoriented supply chain characterized by fluctuating milk prices of low quality and with few and dissatisfied stakeholders.

Discussions based on the finding and literature found out that over 90% of farmers in Keiyo south district were delivering milk to the chilling plant, with well-coordinated transport system. Information flow was efficient and well managed by an automated system with instant feedback on quality, volumes and price. It was further revealed that milk prices for both districts are same at an average price of Ksh 30, but extra benefits of credit, price stability, bargaining power and market reliability all marked the difference with farmers in Keiyo South benefiting as opposed to those in Keiyo North.

The study revealed that the most constraining factor in Keiyo North is the inability to form viable organized farmers group that has a business touch, and in especially the ability to consolidate milk at one point which can help them have bargaining power and improve their position along the chain.

Finally the study made recommendations aimed at improving the situation in Keiyo North. First, it recommended that the district can borrow heavily on the hub system especially adopting its automated system within the stakeholders, it also recommended that the livestock ministry to improve on their inventory of the dairy farmers and their livestock. The second recommendation

is for EADDP to scale up its operation to cover Keiyo North district, as well as for New KCC to start payment based on quality and to look at possibilities of allowing the Keiyo North farmers to buy off the cooling plant through shares accrued by selling of milk, and finally it recommended for the dairy board to enforce quality regulation in Keiyo North and link farmers to more stakeholders of the region.

CHAPTER 1: INTRODUCTION

1.1 Background information

Keiyo District is one among the larger 19 districts making up the rift valley province in Kenya, covering an area of 1441 Km² and a population of 182,875 persons (Statistics, 2011). The larger district is divided into the Keiyo North and Keiyo South districts and has three distinct agro-ecological environments namely; the highlands, the escarpment and the Kerio valley (see figure 2 and Table 1 below).

Table 1: Keiyo District Population, Households, Population density and area

Constituency	Male	Female	Total	Households	Area in Sq. Km.	Density
Keiyo North	36,439	37,276	73,715	15,658	541.00	136.23
Keiyo South	54,408	54,752	109,160	22,400	900.00	121.32

Source: Kenya National Bureau of Statistics 2011

1.1.2 Dairy production in Keiyo District

The district is dominated by small holder farmers and dairy farming forms a major livelihood among the farmers and is ranked the first in order of farm product preferences (District Livestock Production Office, 2010).

Milk marketing in Keiyo North is dominated by the informal sector and selling of milk is done mainly through middle traders, who bulk them and transport them through plastic containers to sale either directly to consumers or through shops and kiosks in the urban centres and is sold as raw milk, thus exposing it to spoilage and risk of contamination (District Livestock Production Office, 2010). Milk marketing system is characterized by low compliance with safety and quality standards, diffuse market structure consisting of many small-scale market agents (hawkers), low value products limited in diversity and weak participation of producer in policy formulation, resulting in low income with limited bargaining power among the dairy farmers (Kenya, 2010a), which according to Vermeulen in her book on chain wide-learning for inclusive agrifood market development affects chain development (Vermeulen, 2008).

The dairy farmers in this region are therefore demoralized and lack incentive to invest, which has thus reduced the yields and left farmers demotivated (forum, 2011). Efforts to form dairy farmers producer group has not yielded much response, with 60% of the total milk produced in the district being sold to the informal sector and 25% to the formal sector through two licensed milk bar and the New Kenya Cooperative Creameries (NKCC) cooler depot located in the region (District Livestock Production Office, 2010), the cooler is currently hardly a quarter full (5,000ml) as most of the milk is sold to the informal sector, thus raising concern by the processor on the viability of the cooler within the region (Rotich, 2012). Farmers are currently dissatisfied with the current milk market situation and are seeking ways to improve their position as well as profitability along the supply chain.

1.1.3 The dairy hub model

Keiyo District is one among the district piloted for the implementation of the Dairy Business Hub Model (DSBM) targeting traditional market, Keiyo South is implementing the project and are marketing their milk together through the initiative of Metkei Multipurpose Company which is a dairy producers company funded by shares from the 5,540 small scale dairy farmers to chill and market approximately 20,000 Kg of milk per day on their behalf (Cheruiyot, 2010), this has helped improve milk payout of these farmers from Ksh 17 to Ksh 32 and has brought in more players into the milk chain, boosting private – public partnership collaboration and bringing in stronger relationship within the chain, resulting in improved milk quality standards better prices for the small scale dairy farmers. Though an impact study on the project has not been done, but the trend looks promising and farmers are interested on how they can adopt the same principle to roll it over the whole district to improve the dairy industry.

1.2 Problem Statement

The weak linkage on milk supply chain is causing low milk receipt among the small scale dairy farmers in Keiyo North District. What used to be the first income earner among the farmers of the region has now been reduced to a more subsistence system with less quantity and quality milk only sufficient for home consumption. Farmers are dissatisfied with the low prices while the traders and processors are concerned about the low volumes. This leads to weak linkage among the chain actors and less return on investment for the dairy farmer.

Milk in the district is marketed individually by small holder farmers both formally and informally as raw, this coupled with inadequate cooling facilities and poor road network makes the dairy farmers have limited bargaining power, as they cannot control the terms of engagement and therefore get less money for their milk.

1.3 Research Objective

The aims of this study are:

- To investigate the milk supply chain of Keiyo North district
- To explore the role played by small holder dairy farmers in dairy hub business in the Keiyo South District in order to improve on the chain relationship among the actors in Keiyo North District.

1.4 Research questions

Main Research Question 1

1. How are milk supply chains organized in Keiyo North and Keiyo South district?

Sub questions

1. What is the system of dairy production in Keiyo district?
2. How many small holder dairy farmers are in the districts?
3. What volumes of milk in litres are marketed per day in the districts?
4. Which market channels exist in Keiyo North District?
5. Which is the most common marketing system existing in the districts?
6. Why is milk marketed through the existing milk supply chains?

Main Research Question 2

2. What are the possibilities of integrating Dairy hub business service model in dairy value chain of Keiyo North District?

Sub questions

1. Who are the actors in the dairy hub business model in Keiyo South District?
2. What are the volumes of milk collected per day within the hub model of Keiyo South?
3. Why is the hub model preferred as a marketing system in Keiyo South district?
4. Why do small scale producers interested in the dairy hub business model of both Keiyo South and North?
5. What are the viability and sustainability measures within the dairy hub business system in Keiyo South District?
6. What quality standard and quality certification exists within the dairy hub business system of Keiyo south?

CHAPTER 2: DAIRY PLANNING AND DEVELOPMENT IN KENYA

2.1 Overview of the dairy industry in Kenya

Kenya has one of the largest dairy industries in Africa, south of the Sahara, estimated at 3,36 million improved dairy cattle (Oparanya, 2010) and is the only country in Africa after South Africa known to produce enough milk to meet its domestic demand and export(Wambugu, 2011). The per capita milk consumption in Kenya is about 90 litres (O'Lakes, 2010).

Dairy forms an important part in the growth of Kenyan economy and is one of the areas targeted to bring the economic growth of the country to a GDP (Gross Domestic Product) to 10% by the year 2012. Currently the sector is experiencing one of the highest growth rate of 3 to 4% annually and is contributing 40% to the agriculture GDP and 14% to the National GDP(Board, 2012). The dairy subsector is important in attaining the development goal of vision 2030. It is dominated by 1.8 million smallholders and pastoral community who produce over 80% of the domestic milk and sale raw milk directly to consumers(Kenya, 2010b), hence accounts for the informal sector milk marketing channel as opposed to the 20% formal sector where milk is sold to the processors.

The formal sector comprises of the licensed and recognized supply channel by the government. Licensing is done by the Kenya Dairy Board and it is given to; specialized milk bars, large scale milk retailers and large scale processors for a range of products and multiple brands. Licensing varies according to volume of milk delivered in each category; for milk bars it is up to 1,000 litres of milk\ each day, for cottage industries is up to 3,000 litres per day, for mini dairies and large processors it is up to 5,000 litres of milk\day (Muriuki, 2011). These products are usually handled in hygienic conditions with quality measures and certification adhered to

There are at least 30 registered processors operating in Kenya, out of which the big ones are; KCC, Brookside, Spin knit, Githunguri and Limuru dairies. Processors handle more than 80% of the total milk and milk products handled through the formal (licensed) channel, and 60% of milk marketed in this channel is by two major big companies; New Kenya Cooperative creameries and Brookside dairies (Muriuki, 2011). According to the dairy board (Board, 2012) Brookside handles 400,000 litres of milk a day accounting for 27% of the total milk handled by 27 processors in the country, while New KCC takes the lions share with 450,000 litres per day equivalent to 37%(Wambugu, 2011). Other actors in the dairy marketing include cooperatives and farmer groups who marketing 40% of the marketed milk and about 20% of the total (Muriuki, 2003).

The informal market usually sells unprocessed milk and their operations are unlicensed. This marketing channel is mainly predominated by small scale traders (hawkers), otherwise also referred to as middlemen and accounts for 80% of milk reaching the consumers, 1.8million dairy-cow owning households with 350,000 full time employees, over 40,000 dairy marketing jobs and low income earners access their milk through this sector (Omore, 2009). The mobile milk retailing hawkers are numerous and highly dynamic in trade entry and exist to the extent that their numbers is unknown. They operate in rural and urban centres, selling on average 50 to 100 litres of milk a day in diverse quantities at about half the price of processed milk (Kenya, 2010b) (see figure 3). Milk in this sector is mainly marketing their milk as raw through the informal sector and thus posing a health risk to the consumers(C. Leksmono, 2006), despite regulation to discourage consumption of raw milk through the informal sector, consumer demand results show that it is only 20% of milk marketed is processed(Muriuki, 2011).

A report by the International Livestock Research Institute (ILRI) (Njagi, 2010) suggests that the liberalization of informal milk markets has producers, vendors and consumers reaping large from an improved value chain (Njagi, 2010). It is in line with this that the National Dairy Master Plan volume II policy document allows for licensing of small scale milk traders to operate with the aim of increasing milk supply to the retail market and milk bars to meet the increased demand for milk, which is projected to reach 12.76 billion litres per year by 2030 (Kenya, 2010b) in line with the country's strategic plan (Vision 2030). However, their selling of unprocessed milk and inappropriate milk handling facilities makes the channel not comply with safety and quality standards as spelt out in Codex Alimentarius code of hygienic practice for milk and milk products (FAO, 2011). The government, through its National Dairy Master Plan 2010 has spelt out the targeting of small scale traders/hawkers for training in hygiene, safety and quality in milk handling to curb rampant malpractices.

It is estimated that the 1.8 million small holder dairy farmers represents 26% of total households in Kenya (Technoserve, 2008), and most of them do mixed farming combining dairy with maize. It is estimated that out of the total farm income gotten by the small scale farmers 40% comes from dairy, which is relatively quick returns for small-scale livestock keepers. It is a balanced nutritious food and is a key element in household food security (Nation, 2012). The majority of smallholders dairy farmers have between three to five acres of land and production of between two to five litres of milk (Muriuki, 2011). Milk sale are on average less than 10 litres per day, with little or no input being used. Smallholders produce the vast majority of milk in developing countries where demand is expected to increase by 25% by 2025. Dairy imports to developing countries have increased in value by 43% between 1998 and 2001.

The government of Kenya, through the Kenya Dairy sector master plan 2010 has recognized the role played by the informal sector and has since legalized it to enable milk producers and traders to improve competitiveness. This promotes small scale farmers and traders group formation to improve their position along the chain as well as to enhance milk safety and quality for higher returns. Among the areas the Kenyan government intends to address to enable producers and traders to improve their competitiveness and profit in the milk enterprise, is the up scaling and out scaling successful models of Dairy Business Development Services in the value chain, key among this is the formation of farmer groups and Co-operative societies to ease logistics in milk collection from smallholder farms (Kenya, 2010b). Metkei Multipurpose Company is one among the Dairy Business Development Model established to take such a purpose in Keiyo District (Cheruiyot, 2010)

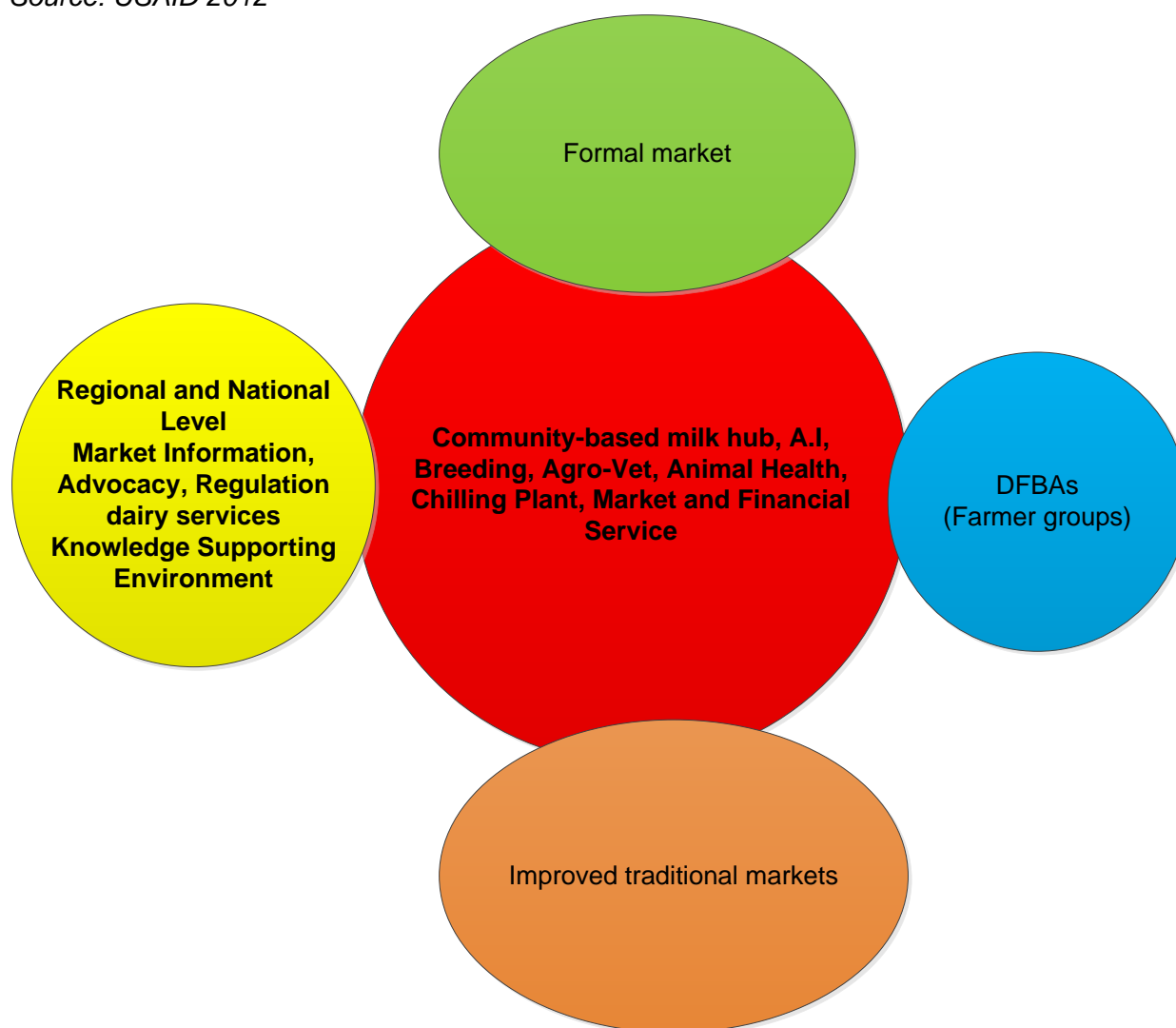
2.2 Dairy Business Development Model

Dairy Business Development Model is implemented by East Africa Dairy Development Programme, a conglomerate of five organizations; Technoserve, American Breeders Society (ABS), International Livestock Research Institute (ILRI), Heifer International and International Centre for Research in Agroforestry (ICRAF). It develops areas that are capable of expanding dairy markets and farmers access to market (Cheruiyot, 2010) by promoting activities that will increase productivity, competitiveness, quality product and farmer support services. EADDP addresses this gap through a dairy business hub model.

A dairy hub is a dynamic cluster of services and activities that generate greater income to the dairy farmer, it includes a chilling plant, Agro vet store, credit facility, feed and A.I (Chepkoech, 2012).

Figure 1: EADDP Dairy Hub Model

Source: USAID 2012



The core of its functional unit is a chilling plant, which generated organized milk collection system that collapsed following poor performance of KCC in the 1990s leaving an erratic milk collection system that are run by dairy farmer cooperatives or farmer groups (Kenya, 2010b). Presently, dairy co-operatives, milk processors and private milk transporters operate the functional milk collection centres.

The hub model is exclusively owned by producers and hires experienced managers to manage it and its facilities and has been successful in revolutionizing the dairy industry. It is designed to generate profit from producers and is usually based in villages or locations where it has become a hub of innovations. In Kenya, there are 21 hubs collecting on average 77million Kg of milk annually and have generated Ksh21.6 billion out of which Ksh16.9 billion have been paid to the farmers (Kathotya, 2012)

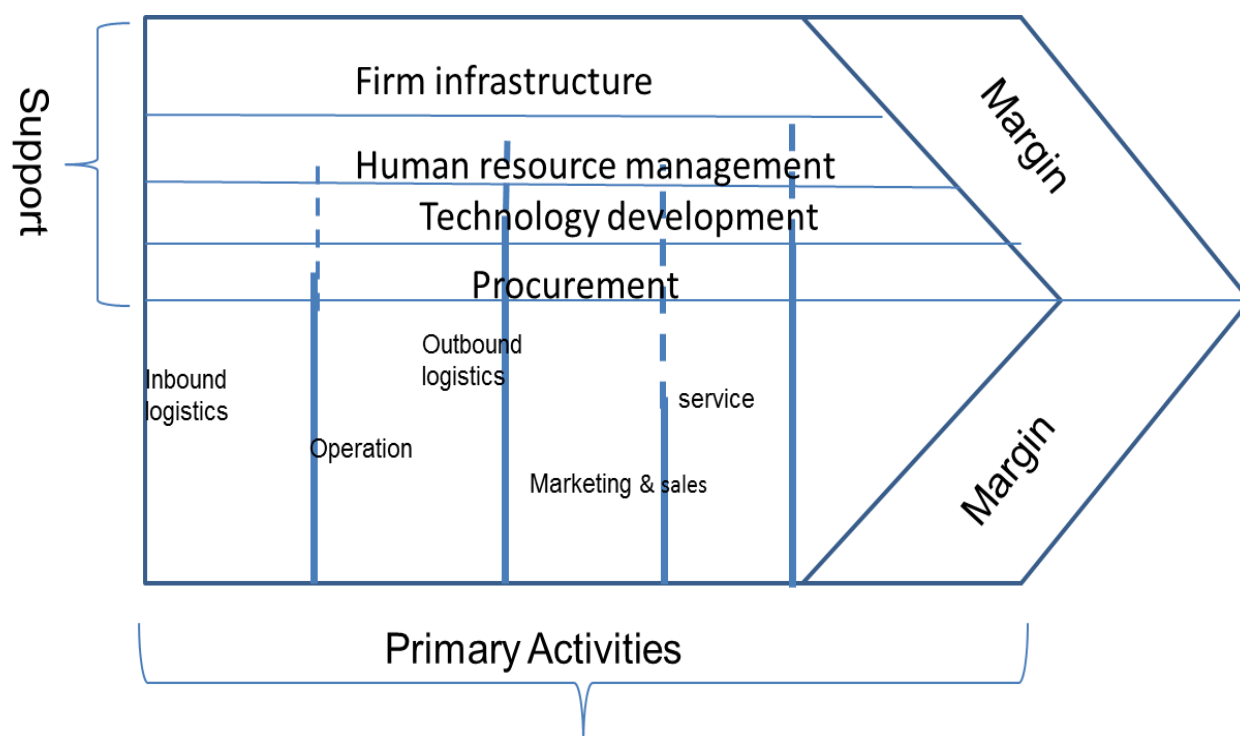
The benefit of the hub model is its ability to counter the challenges faced by the dairy farmer on not being able to access breeding services, feeds, animal healthcare, production inputs, and inadequate relevant information. The hub glues farmers together into groups with their core

service of bulking volumes of milk, and thus gives them the advantage of competitiveness and negotiation as well as to access affordable extension service, transport, agro-vet, feeds, profit, competitive price and also loans and credit (Kathotya, 2012). It engages services of the youth who offer transport for farmers far off the chilling plant saving them from transport problem thus they can concentrate in production. Success depends on highly in leadership and financial integrity.

The hub model is therefore an efficient way of doing business, it creates value to buyers by chilling and bulking of milk and results in competitive advantage which can be analyzed by how it fits in the value chain, the efficiency on how it does this depends on its logistic which can be illustrated by use of Michael Porter's principles of competitive advantage (see figure 2 below)

Figure 2: An illustration of business unit value chain

Source (Bolo, 2011)



Each primary support activity of the DBHM which are on collection, transport, recording, chilling and quality control therefore have an opportunity to produce in the market products and services that meet or even exceeds the expectations of the buyer which are huge volumes and chilled milk.

2.3 Overview of Dairy Value Chain

The Kenya value chain has both government recognized formal and non-government recognized informal markets (see figure 3). It is characterized by fragmented actors at each level with limited vertical integration. The formal market is served mainly by medium to large scale dairy farmers and connects the market via a chilling plant while the small scale farmers usually sell raw milk and connects directly to consumers via numerous middle traders/hawkers.

The informal market is cash based and therefore preferred by majority of farmers, it harbour's most of the small holder dairy farmers and accounts for 80% of the total milk delivered to the market in Kenya (Omore, 2009). It is estimated that on average 70% of milk reaching the consumers are delivered by the informal traders (COMESA, 2004). The actors in the informal sector are made up of; Producer-sellers, mobile middle traders, large scale wholesalers, farmer groups and retailers in the Kiosks, milk bars and shops. There is no quality control in this sector allowing the producers to sell milk that would be rejected by the processors, afternoon milk which cannot be accepted the following day by processors are usually delivered through this channel. The DBHM acts as a link between the informal market supply chain by adding value in through chilling, transport and quality control.

Price

Despite of the competition between the formal and informal market, the farm get price of milk is barely the same. The only difference is the mode of payment. The informal market pay in cash while the formal market pay monthly (Technoserve, 2008).

The price of milk takes different routes and fluctuates depending on seasons. With the price at farm gate changing from Ksh20 to Ksh 30 (USAID, 2012), while that from a packet of half a litre of processed milk is fluctuates between Ksh30 to Ksh45 (Ndung'u, 2012). In general the price of processed milk remain relatively stable that raw milk, during wet price of raw milk fall by up to 20% while during dry season it increases by up to 30% (Technoserve, 2008), affecting price differential of the processors. In general prices to the end consumer in the Kenyan market is 30% to 40% lower in the informal market than the form (Technoserve, 2008).

Transportation

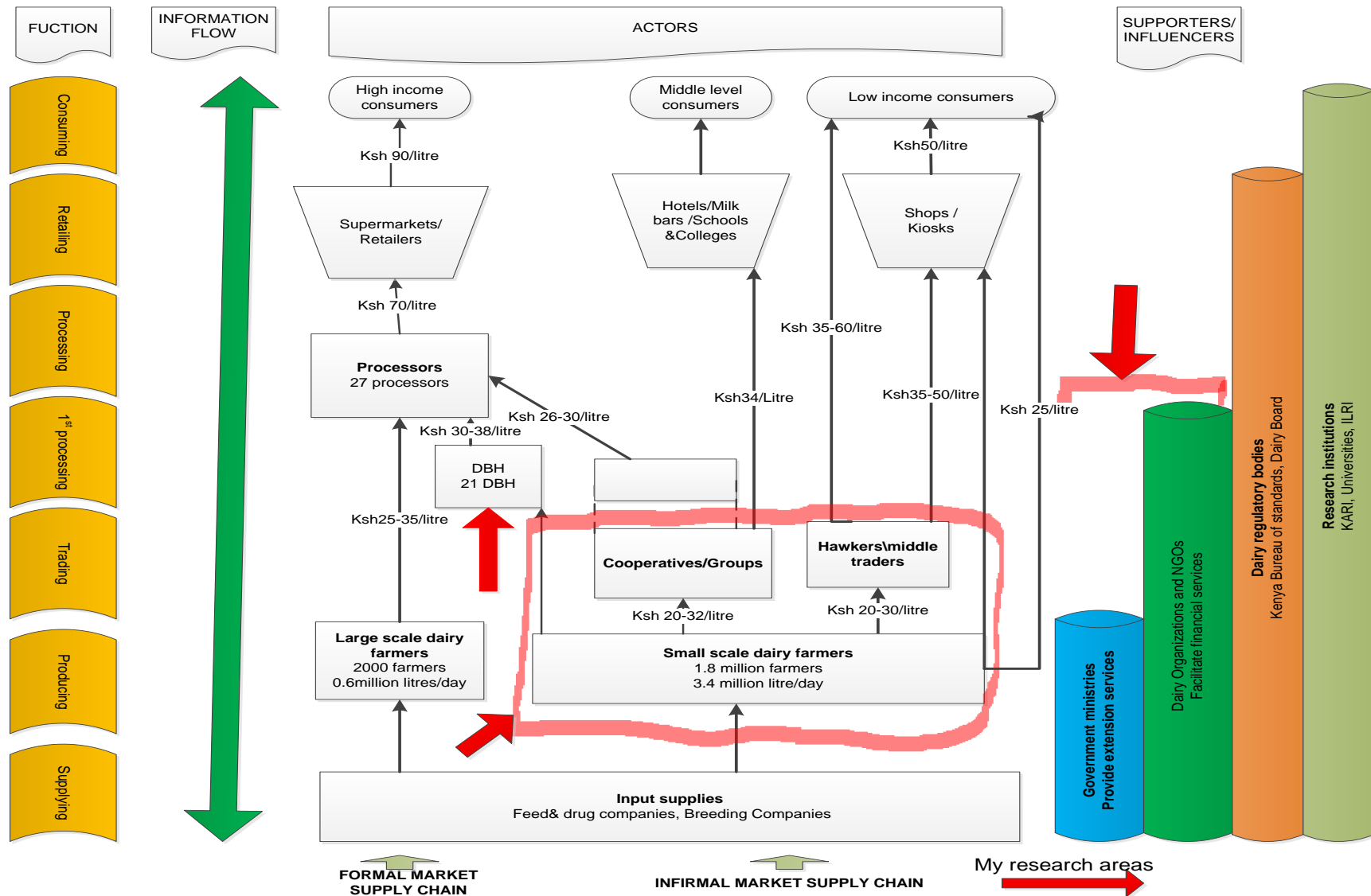
Transportation mainly in the informal sector is by use of bicycles, foot or donkeys, motor bikes are also slowly coming in. A study by Technoserve in Eldoret town on use of bicycles (Technoserve, 2008), show that most bicycle transporters transport 100Kg of milk per day at a distance of between 10 to 30Km, earning a spread of Ksh 4 per litre of milk, and since all cost are fixed the driver of profitability depends on the volumes being transported. The break-even point for most of the transporters is 60litres (Technoserve, 2008)

Chilling

Chilling plants are owned by farmers or cooperative groups with an aim to add value to raw milk which is then preferred by the processors because it maintains quality and reduces the risk of spoilage before it is subjected to further processing. The chilling plant normally charge a cost of Ksh 2 for chilling (Cheruiyot, 2010)

Figure 3: Conceptual Framework Dairy Value Chain of Kenya

Source: modified from (USAID, 2012)



CHAPTER 3: METHODOLOGY

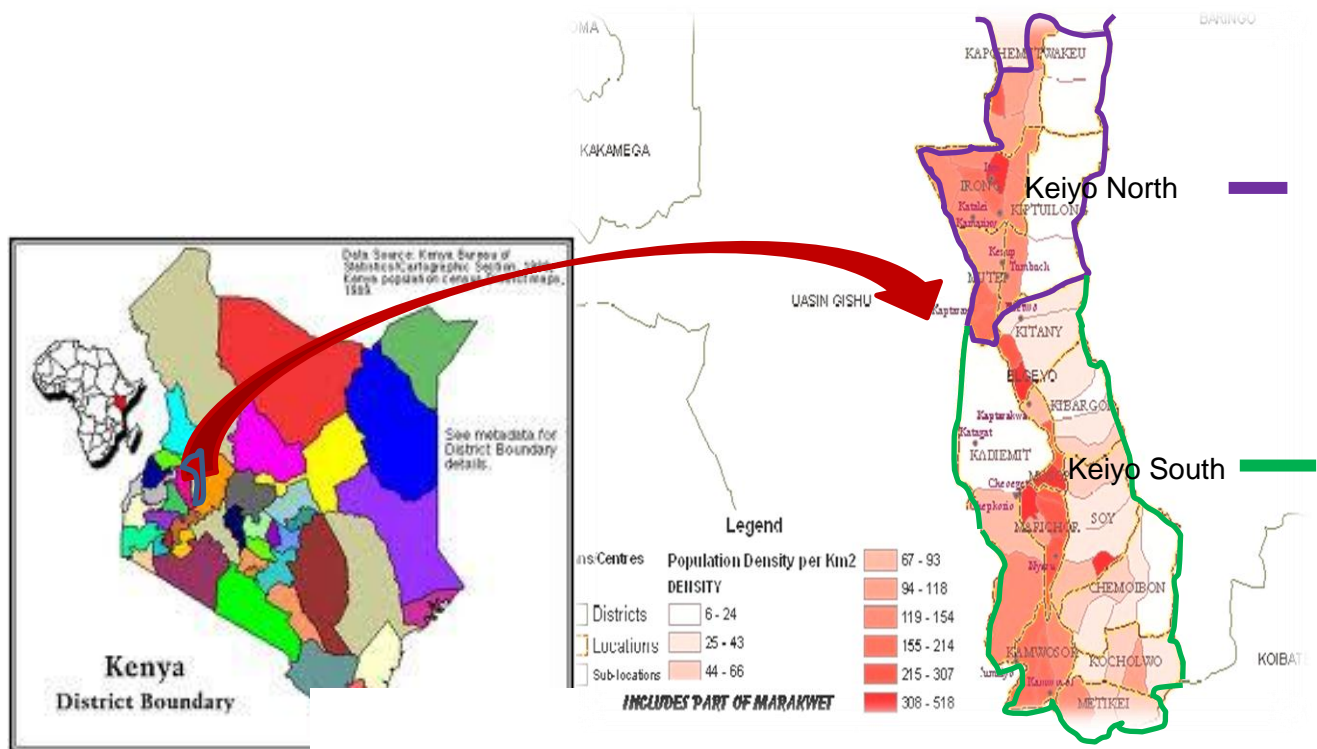
This chapter lays focus on the study area, research design and data collection methods. The approach used in this study is both qualitative and quantitative. Questionnaire and checklist is used in both Keiyo North and Keiyo South, specifically among the players who are either directly or indirectly involved in the milk chilling plant which is the center for operation of the Dairy Hub Business Service Model (see figure 6).

3.1 Area of study

The study was carried out in the larger Keiyo District which comprises of the two daughter districts of Keiyo North and Keiyo South as indicated in the map below (see sub section 1.1.1, table 1 and figure 4 below). A survey was done for Keiyo North while case study was done for Keiyo South. The focus was on dairy farmers who are found in the highlands and escarpment, therefore these are the areas targeted for the study in both districts.

Demographic and social area maps were used for identification of social infrastructure which includes roads, electricity, water, schools, telephones, land, gender and health facilities which contribute to dairy industry in the area. six sites were selected, three locations from each district that are closely homogenous in nature based on; dairy population, volume of milk, Milk supply to chilling plant (High, moderate and low suppliers) and population of small holders dairy farmers.

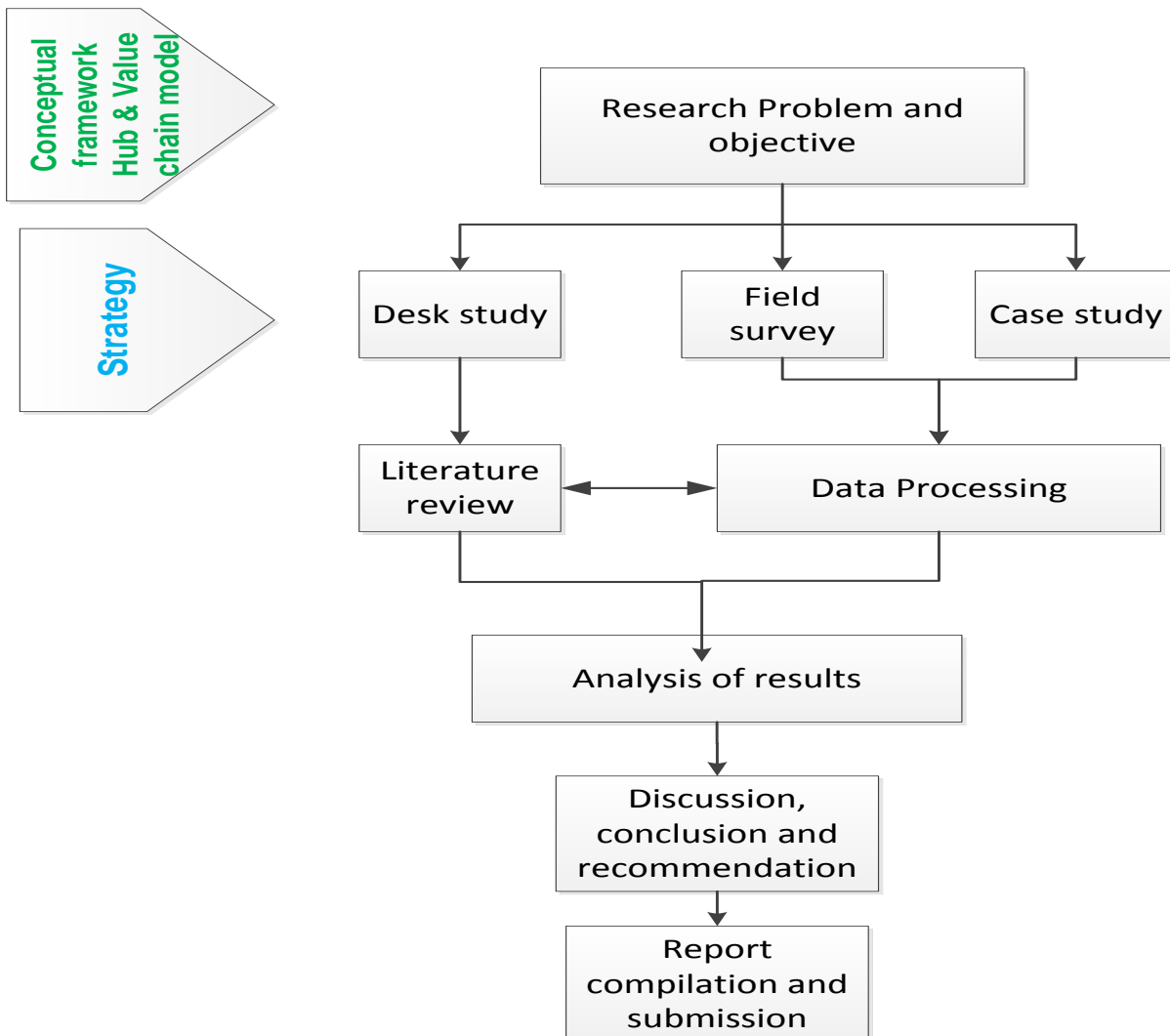
Figure 4: Map of Kenyan District, showing Keiyo District (source: Kenya Bureau of Statistics and Keiyo District development Plan 2005 -2010)



3.2 Research Framework

The research design (figure 5) is developed in order to guide the study into a successful implementation (Verschuren, 2010).

Figure 5: Research design and framework



3.3 Desk Study

Secondary information was collected by Google search information on various internet sites related to the research topic and the findings accessed and documented. Books from the library and library sites of Google scholar and Scopus were used, as well as government documents accessible from the district, through e-mails, telephone calls and face to face contact. Lecture notes under agriculture chain management course will also be used.

3.4 Case study

The case study is taken based on Metkei Multipurpose Dairy Company, which is a dairy business hub model located in Keiyo South, but this was not limited to Metkei as Iten cooling

plant was also considered. A check list (see annex 2) was used for the interview designed based on specific roles played by a particular stakeholder on its contribution to the development of the dairy industry.

A total of 18 stakeholders were interviewed and the information presented through value chain using the framework based on 'Donor Intervention in Value Chain Development, working paper' (Roduner, 2007). Stakeholders were chosen based on information from the cooling plant and prior knowledge of the area, and advance appointment was made through; telephones, e-mails and face to face method were used.

Interviews were carried out by use of telephones, voice recording and face to face contact. A total of 18 interviews were carried out:

New KCC Iten cooling plant

Iten cooling plant was chosen as a comparison point for Keiyo North with Metkei Multipurpose Company in Keiyo South, as they are both involved in bulking and chilling of milk but are under different ownership. The regional field service officer in charge of North Rift and the, Mr. Edward Bor was interviewed based on the positive as well as the negative factors contributing to the development of dairy industry in the District.

Transporters

Six transporters supplying milk to the chilling plant were interviewed in total, three from each district of Keiyo North and Keiyo South. The selection was based on the mode of transport and the categories of farmers they serve.

Other service providers

Other service providers were selected based on the kind of service they offer to the small scale dairy farmers; training, financing, group formation, lobbying and Marketing as well as category they fall into; Non - governmental organization (NGO), Governmental institutions, Community based Organization and Private dairy developers.

Ten other dairy service providers were interviewed; two private field extension staff, two NGOs, one Milk bar, four Middle traders/hawkers and one milk regulatory body (*See table 2 below*).

Table 2: Stakeholders interviewed from Keiyo district

Stakeholder	Role	Interview purpose	Interview procedure
Ministry of livestock & Ministry of Cooperative development	Stakeholder mobilization Government policy development Extension and training	Identification of relevant stakeholders Identification of small holder dairy farmers. Collaboration on resource utilization.	Literature review of reports. Use of check list.
Middle level traders (hawkers)	Transport of raw milk through the informal sector. Contribution to milk marketing chain.	Roles played in milk marketing. Volumes of milk handled. Relationship with the producers and customers.	Check list. Critical observation. Literature review and available reports.

		The possible effect and response due to adoption of the small scale business model.	
Small scale dairy farmers	Production and marketing of raw milk	How the farmers currently marketing their milk. What are the gross margins profits made? Why do the farmers choose different marketing systems Relationship of farmers with other actors	Questionnaire Critical observation Information from neighbours
East African Dairy Development Project (Technoserve)	Establishing of dairy hub marketing model	Origin of the hub model Operation of the hub model The role played by small holder dairy in the hub model The relationship among the various actors in the hub model	Check list
New Kenya Cooperative creameries –Iten cooling plant	Bulking and cooling of milk from small holder dairy farmers	Volumes of milk being handled by the company. The relationship with its suppliers. The relationship with other actors in the chain. The sustainability measures put in place.	Check list Literature review Reports and records
Mindililwo Zero grazing milk bar	Bulking cooling and marketing	Volumes of milk being handled by the company. The relationship with its suppliers. The relationship with other actors in the chain.	Check list Literature review Reports and records
Metkei Multipurpose Company	Bulking, Cooling and Marketing of milk from small holder dairy farmers.	Volumes of milk being handled by the company. The relationship with its suppliers. The relationship with other actors in the chain.	Check list Literature review Reports and records

		The sustainability measures put in place.	
Kenya Dairy Board	Milk quality regulation and issue of certificate to operate in the Kenyan dairy Industry	The implementation of dairy regulation The role played by the body in Milk collection	Check list

3.5 Survey

A field survey was done using a structured questionnaire designed to interview small holder dairy farmers in both Keiyo North and Keiyo South districts and was designed to give a wider scope that meets the objective of this research in both situations. It was designed to focus on areas of milk quality, Information flow, group formation and sustainability areas of profit and milk benefit distribution.

The questionnaire was administered in the two divisions of Kamariny (Keiyo North) and Metkei (Keiyo South) with the help of the Divisional Livestock Extension Officers (DLEOs) upon briefing by the researcher. Two farmers from each site were used to pretest the questionnaire and necessary improvement made on questions that were not clearly answering the objective of the research, it was also used as a learning point for the DLEOs.

Farmers selected from the divisional dairy farmers list were linked by the DLEOs to the researcher. Selection was based in locations around the chilling plant with location having equal number of questionnaire administered at different points within the area. Farmers were selected at a radius of not more than 15Km from the chilling plant.

The questionnaire was administered face to face with the result field directly on the form, voice recording was occasionally used for picking of issues not included in the questionnaire.

3.3.1 Sampling method

Sampling was done in the two divisions of Kamariny division of Keiyo North and Metkei division of Keiyo South. Sampling was evenly distributed around the areas where the chilling plants (Iten milk cooler and Metkei Multipurpose Company) are located, and farmers chosen from three locations of Kamwosor, Tumeiyo and Maoi in Metkei division and Irong, Sergoit and Chebaror in Kamariny division were selected. The choice was based on:

1. The majority of small scale farmers supplying milk to the cooling plants are from the region hence are representative of the whole district
2. Limitation on funds and a challenging road coupled with inadequate transport to cover other divisions
3. Most of the stakeholders involved in dairy value chain are located in this regions
4. Most of the milk to the coolers comes from this region

Selection of farmers was based on gender and farmers of all ages selected (see figure 2 & 3 Below), the divisional livestock extension officer (DLEO) and the Acting extension manager Metkei multipurpose company were used to identify the farmers to be interviewed, who were also verified by the researcher based on the farmers list from the district livestock office or the chilling plant.

3.3.2 Sample size

40 farmers were selected based on three major categories;

- The first category will be those dairy farmers who supply milk to coolers (chilling plant),
- The second category will be male and female
- The third category was where they come from.

Each of the six locations for each division had six farmers with two farmers per each division used to pretest the questionnaire. Six transporters and three milk middle traders (hawkers) were interviewed. Five different stakeholders involved in service delivery among the dairy farmers with each from the government ministry, Non - governmental organization, Private firms, Cooperatives and individual farmers groups were also interviewed.

3.6 Data processing

The case study results are presented by use of chain maps, hub model analysis, pictures and by use of descriptions. District annual and quarterly report was used to validate the findings.

The final data gathered during survey was clustered into the two districts of Keiyo south and Keiyo north district and arranged according to its reference numbers. The outcome were then analyzed by use of statistical package for social science (SPSS version 19) and excel worksheet, and the result processed by use of cross tabs, Anova, Kruskal Wallis, bar charts and tabulations. The SPSS was used to find under a 95% confidence limit and significance recorded.

CHAPTER 4: RESULT OF THE CASE STUDY

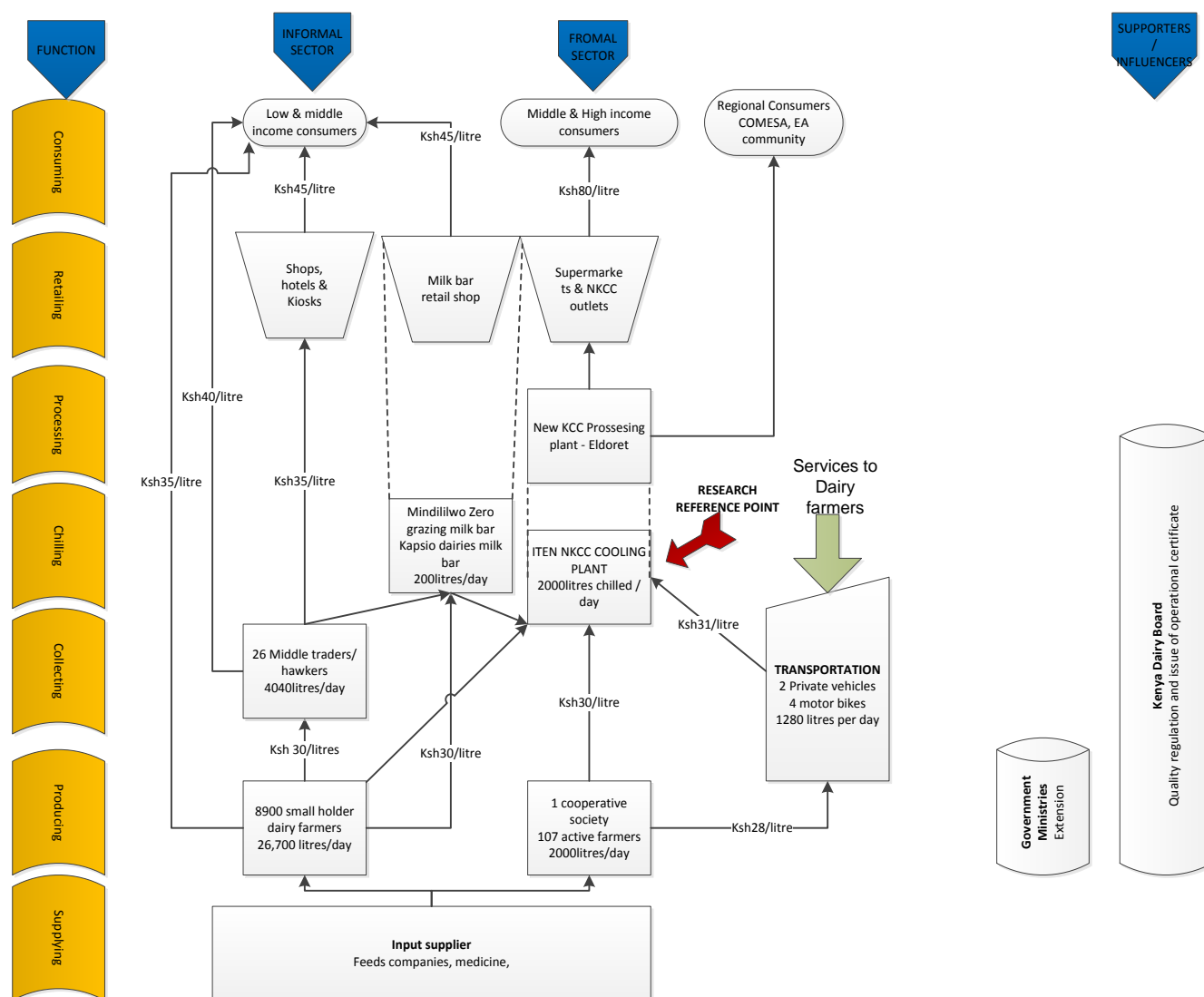
This chapter is given in to two sections: the first section presents the case study result upon the interview of 18 stakeholders involved in Metkei Multipurpose Company chilling plant and Iten – KCC cooling plant.

The chapter answers sub questions 1.4.1 and 1.5.1 of this report. The chapter will be marking references to Keiyo North and Keiyo South as the current split districts of the larger Keiyo District.

4.1 Keiyo North District Dairy sector

This sub section contains the result obtained by interview of nine stakeholders involved in the dairy sector in Keiyo North district. Both actors and supporters of the milk supply chain were involved and were categorized into the Government, hawkers, milk bars, transporters and Milk coolers.

Figure 6: Milk Supply chain of Kamariny division – Keiyo North (see annex 6 for a larger picture)



4.1.1: Stakeholder analysis of Kamariny division - Keiyo North

	Stakeholder	Key function	Influence/power
Actors	Iten Agro vet shop	Supply farm inputs, feeds and drugs to all dairy farmers in the area, get supplies from different feed manufacturers	Low
	Small scale producers	Produce milk mainly for household use and for sale	Low
	Progressive Cooperative society	Collect and transport raw milk from members to chilling plant. Payment are made through them for its members	Low
	Iten – NKCC cooling plant	Bulking, chilling and quality control on behalf of the processor NKCC	Low
	New Kenya Cooperative Creameries (NKCC)	Quality control, Processing, grading, Packaging and wholesaling. They mainly control the formal sector	High
	Supermarkets	Sale only processed milk and milk products.	Low
	Mindililwo Zero grazing milk bar	Sale of chilled milk and offer A.I services	Medium
	Middle trader/Hawker	Collecting of raw milk and selling to the consumers.	
Supporter	Ministry of Livestock Development	Advice, linkage, information dissemination, farmers training, health services and quality control.	low
	Ministry of Cooperative development	Advice, certify and oversee election within the cooperative societies.	Low
	Kenya Dairy Board	Control and regulation of dairy industry, offers operation certificates to the hawkers	High

4.1.2 Milk marketing in Keiyo North district.

A brief interview from the district livestock production officer (DLPO), Keiyo North district revealed that till after three years ago, dairy remained the number one income earner to the small holder's farmers within the district, when it was overtaken by passion fruit giving a gross profit of Ksh 120,000 per quarter of an acre, but the current losses due to disease outbreak in passion and the increase in price of milk within the dairy sector has led to more farmers reverting back to the enterprise.

The DLEO for Kamariny division stated that dairy used to be vibrant in the district in late 1980s and early 1990s under the national dairy development programme (NDDP), which was a programme sponsored by the Netherland government that helped established zero grazing units and improve dairy cow breeds within the region. He said that ever since the end of NDDP the division has never had any dairy implementation programme till June 2010 when a one year radio programme which was FAO funded helped provide extension services to the farmers.

Kamariny division has a total of on average 16,288 herds of cattle out of which 9, 511 are dairy cattle, according to the DLEO, Kamariny division, this gives on average 775,398 Kg of milk per year from on average 9,000 small holder dairy farmers. The district cooperative officer (DCO) of the larger Keiyo district, Mrs. Lucy Siseda said that Keiyo North district has no strong cooperative societies and marketing of milk is not organized with over 80% of the milk being marketed through the informal sector, and is transported mainly to the neighbouring district of Baringo. The rest goes through 2 milk bars and Iten New KCC cooler (*see figure 12*).

4.1.3 Iten New KCC cooling plant.

Information from the interview of Mr. Edward Bor, the field service officer New KCC in charge of North Rift Valley region stated the Iten New KCC cooling part is part of the six cooling plants the processor has in the region, it is serving Elgeyo Marakwet County. He said that the cooling plant was established in 1996 and after the collapse of the Kenya Cooperative Creameries (KCC) it was revived in the year 2008 when the government of Kenya stepped in to support the processor, it has a capacity of 20000 litres but currently it only receives 2000 litres per day, thus he said that the facility is underutilized.

He said that there are 98 farmers currently supplying the cooling plant with milk, but there is another group from Marakwet district known as Progressive which has 300 members but 107 are active which supply it with on average 1000 kg of its milk daily. He further said that the company is understaff and needs to employ three more to beef up the current 4 already available who are not technical. He feels that the employment of especially the raw milk procurement officer will help to enhance milk procurement and assist in farmers extension services.

The cooling plant offers a price of between Ksh 30 to 34 depending on volumes or the prevailing market forces of demand and supply, he also said that there is plan of introducing prices based on quality. He said that the cooling plant only have formal agreement with farmers we are supplying milk more than 500 kg and above per day. He attributes much of his challenges to low milk supply by farmers and even at one time the processor New Kenya Cooperative Creameries (NKCC) threatened to relocate the cooling plant, but it received resistance from the local community, and the fact that it has a stable supply throughout the year. He attributes the low supply to hawkers who pay slightly more and in cash, other upcoming processor of Brookside and Buseki are also adding to their competition.

4.1.4 The Middle milk traders/hawkers

The DLEO, Kamariny division said that there are a total of 26 hawkers (middle milk traders) in the division each on carrying on average 40 kg of milk daily, he said that the hawkers mainly supply kiosks, hotels, milk bars and consumers directly with raw milk. An interview with Mr. Alex Kemboi Kipyego a milk hawker from Kapsessum village in Sergoit location stated that he collects milk from 6 farmers and sells it to hotels where he gives 12litres, Kiosk 10litres and individuals 8 litres, he further said that for hotels he sells his milk at Ksh 40 and for Kiosks it is Ksh 35, while he buys milk from farmers at Ksh 30 per litre and pays his farmers weekly.

Mr. Kemboi said that three weeks ago he bought a lactometer at Ksh 250 to which he uses for testing milk incase farmers add water as most of his customers do not accept watery milk. He sighted his challenges as; unreliable weather roads, strict rules by the Kenya Dairy board forcing them to take milk to NKCC, farmers demanding high prices for milk and some unreliable farmers who sell milk that is not fresh.

4.1.5 Milk quality

Quality to the consumer is based on whether the milk is fresh or added with water, this was the interview information of a hawker, Mr. Alex Kemboi (see *sub-section 4.3.3*). An interview with the quality clerk Iten NKCC cooling plant said that the chilling plant maintain quality in seeing that milk from far off distance is collected at 6 am to be able to arrive to the plant while it is still cold, a ten minutes sample test is using organoleptic and alcohol test is done at the platform before milk is accepted into the chilling plant, he further said that they are discouraging the use of plastic containers but farmers are still using them (see *figure 13*).

Picture 1: A picture of milk on a truck with a number of plastic containers being delivered to the chilling plant in Kamariny division.



4.1.6 Logistic

An interview with three transporters to the cooling plant outlined that milk is transport raw an each farmer has his own container, which upon delivery of milk is returned back to its owner. One motor bike transporter Mr. John Chepkurui from Chelingwa says that he transports between 60 to 70 Kg of milk per day and charges between Ksh 2.50 to Ksh 3.50 per kilogram of milk, while Mr. Edwin Tarus from Rae said that he farm transports for a group 1000 Kg per day and charges Ksh 4 per Kg of milk which is paid through check off system every month. The cooling plant only caters for transport of milk by use of NKCC tanker to the processing plant, and it's done every other three days.

2.1.7 Successful factors for Keiyo North dairy sub sector

Cooperation among the dairy farmers

The farmers are forming smaller family groups for the purpose of milk transport especially for those far off the selling point is a positive indication of cooperation among themselves, this groups were witnessed in Sergoit and Chebaror locations.

Easy flexibility with market forces

The actors in the district adopt very fast to changes mainly brought by seasonality such as price, so they can withstand the shocks brought about by change in market forces, and due to the fact that they are a livestock keeping community, it is not easy for them to abandon dairy enterprise as milk form part of their major diet.

2.1.8 Limiting factors for Keiyo North dairy sub sector

Limited farmer organizations

Farmers in the district have very few organized group that are meant to promote dairy as a business, few family groups that do not handle less than two hundred litres of milk are available but the volume is insufficient for larger processing companies

Few dairy stakeholders

The district has only one processor operating in the area, the rest of the actors are more of middle traders and whole sellers who are mainly interested in milk during dry season and abandon the whole business during wet season when milk is in plenty making it a seasonal business.

Low milk volumes

The district produces low milk volumes which discourages dairy investors in the region, though they have better dairy breeds that are recommended for high yielding, their production per cow is low, on average each cow gives four litres per day.

Competing high value crops

Till up to the year 2011, passion was a crop that gave more return to the farmers per unit area of land, this made most of the farmers to shift from dairy to passion, but disease outbreak in the crops is making dairy them come back to dairy.

Insufficient credit facility

This is only limited to farmers taking milk direct to the processor cooling plant and who have large volumes the can act as collateral. Immediate emergency issues such as school fees or sickness are rarely solved through sale of milk.

4.2 Keiyo South District Dairy Sub sector

The divisional livestock extension officer (DLEO) of Metkei division, Keiyo south district indicated that dairy is an important and a major enterprise in the district necessary as a source of food, wealth and job creation for about 18,130 small holder dairy farmers. The district, he said, boasts of having two dairy business hubs in two of its division namely; Metkei and Chepkorio, out of which Metkei produces 3,155,152 Kg annually accounting for 31% of the total milk produced in the district from 62,888 heads of cattle in the division.

He said that information from the cooler indicates that there are 40,000 dairy cattle lactating currently of whose milk go to various channels; the chilling plant which is owned by Metkei Multipurpose company (MMC) gets approximately 12,000 Kg per day, Brookside Processor gets 400 Kg per day which he said are from farmers in Kocholwo region, 750 Kg per day goes to the Local market which include - hotels, shops, schools, tenants and health centres, 6000 Kg for daily home consumption, 200 for vendors to Eldoret town and approximately 20,000 Kg per day is left for the calves.

4.2.1 History of Metkei Multipurpose Company

Metkei Multipurpose Company is a loose confederation between four cooperative societies namely; Metkei, Kapkitony, Tulwabei and Kipsaos, this was stated by the plant manager of the company. He further said that the company was registered in November 20th 2008, with an aim of increasing income to the small holder dairy farmers through collective milk marketing based on the hub business model which was promoted by East Africa Dairy Development Programme (EADDP).

The MMC board chairman concurred with the plant manager that initially farmers were marketing their milk individually or through individual cooperative, the prices were low between Ksh12 to Ksh16 per Kg and that all four cooperatives had a compounded volume of 3900 Kg per day. Due to unavailability of a cooling facility most of the afternoon milk went into a waste as it was never collected by the processors, this left farmers demoralized hence the need of the four cooperatives seeking means of assistance through proposal writing to Heifer Project International, which if one of the conglomerate of EADDP for support.

The plant manager further revealed that the confederation started with 4090 Kg per day of milk as at 1st October, 2009 and by December 31st 2009 it was already marketing 17,000 Kg of milk even before the launch of a chilling plant which to place on 22nd October, 2010 and the price increasing to Ksh 27 per Kg. Currently he said the company manages between 12,000 – 22,000 Kg per day depending on rain or dry season.

The company is managed by 13 elected members of board, 8 of which are drawn from the cooperatives and 5 from existing individual groups. A total of 6818 dairy farmers are registered with the company, of which 4240 are active thus bring milk throughout the year, this information differed with that of the acting extension manager who stated that there are only 1350 farmers who are active.

4.2.2 The hub model

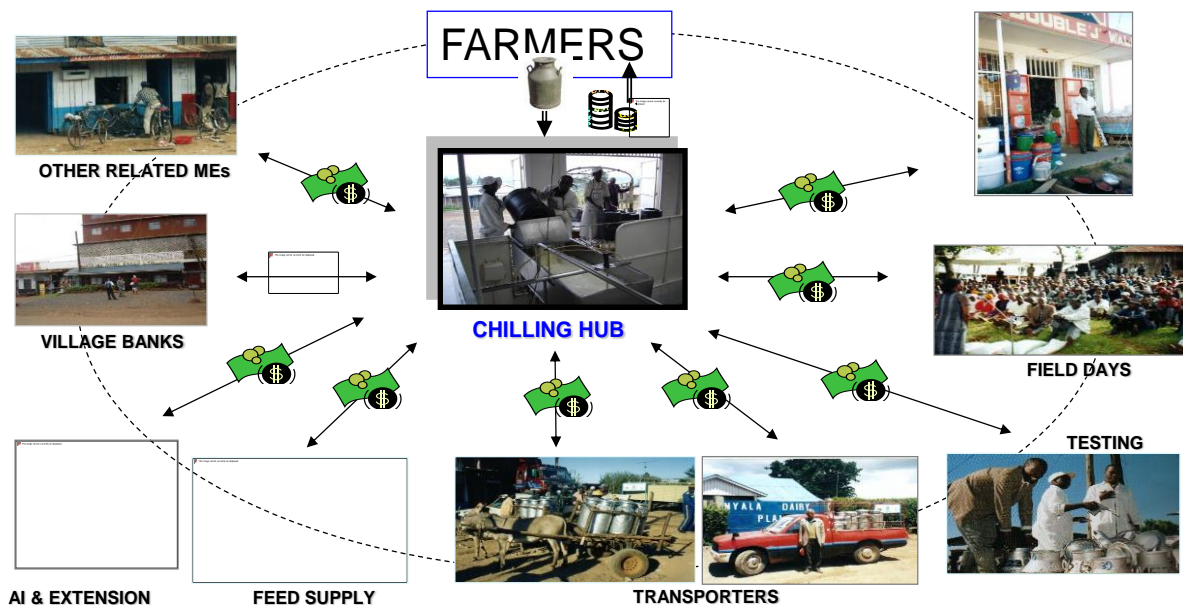
The model was an origin of a board room meeting of Technoserve in Kenya which is one of the conglomerates of EADDP, this information was given by the former Technoserve business advisor in charge of Metkei currently the senior business advisor with Technoserve project nature, she further outlined in the interview that the idea behind its operation is based on a chilling plant with services around it that support the dairy business. She said that in order for a

site to be considered as a dairy business hub model, four services to the dairy farmer have to be operational, and these are; Artificial Insemination service (A.I), Dairy Feed, Credit services and a chilling plant, this was also echoed by the plant manager MMC.

“The name the hub model was drawn from a bicycle hub with have spokes that controls the operation of the whole wheel, similar to the chilling plant that control the operations of the entire services to the dairy farmer,” she said (see figure 5 below)

Figure 7: A dairy hub business model

Source: Cheruiyot, 2010



4.2.3 East Africa Dairy Development Project (EADDP)

“EADDP does coordinative and facilitative roles by ensuring an effective running Dairy business hub (DBM),” this was the response of the Chairman to the board of directors of MMC when asked by the researcher on what role EADDP project plays now that the company is functional? The same was echoed during the interview with the senior business advice who said that the role of training and capacity building by the EADDP is to facilitate business plan for the hub, as well as offering advice to the managers to make sure that their cash flows are right in order to increase efficiency in their operations and to sign good contracts.

4.2.4 Metkei business hub supporting services

Metkei multipurpose company (MMC) as the dairy business hub model is supported by four other services in the division, these are; feeds, transport, chilling plant and Artificial Insemination (A.I), this was the answer given by the Divisional Livestock extension officer, Metkei division on the services offered by the MMC to the dairy farmer. The same was said by Mr. Gideon Koima, the acting extension manager MMC, but he also added credit.

The Metkei chilling plant

A brief by the plant manager during the interview stated that the plant was commissioned on 22nd October, 2010 by the Permanent secretary in charge of Livestock development, Hon Kenneth Lusaka. The plant was installed at a cost of Ksh 13, 951,000 with 90% as loan while 10% was shares contributed by the dairy farmers. Upon its installation milk volumes rouse per day from 4090Kg by 2009 to 22,000 Kg by 2011, and currently in 2012 due to prolonged dry spell the intake is at 13,000Kg on average.

Picture 2: shows Metkei chilling plant



The plant has an automated system is controlled by the quality manager and it records the daily milk deliveries, with the farmer and the transporters name indicated (see figure 7 next page)

Figure 8: An automated dairy system at Metkei chilling plant

Supplier Number F

Milk Date

Quantity Supplied (Kgs)

Today's Total (Kgs) **11323.7**

☐ Print Receipt ☐ To Notepad

☐ Add Comment

Printer Port

Receive Reprint

Transporter's Receipt

Transporter code

Print Transporter Print Summary Print Self

Today's collection

SNo	Names	QNTY	Time	Receipt No.
2	TUMEIYO F.C.S	202.5	4:12:03 PM	650983
2	TUMEIYO F.C.S	16.8	3:47:06 PM	650982
495	SARA KIPKOSGEI	4.4	3:47:01 PM	650981
763	TERIKI KIPKORIR	4.8	3:46:54 PM	650980
679	KIPCHUMBA KIBWALEI	8.3	3:24:53 PM	650979
429	JACKSON K CHEROP	6.2	3:22:14 PM	650978

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An interview by the quality manager indicates that system in addition to quantity, also indicate the time and receipt number instantly upon receipt of milk.

The plant has three departmental heads namely; Quality assurances manager, Plant accountant and Plant manager who are employed on permanent basis, together they work with 4 other temporary and three security officers.

Milk Transporters

The milk transporters interviewed were of three categories namely; cooperatives, Individual farmers group and private transporters, who are paid every month by Metkei Multipurpose company by check off system. All milk transporters are accredited by the Kenya dairy board to ensure that they comply with the laid down standards. This was the information given upon interview with Mr. Cheserek, the chairman Kenya dairy board.

Cooperatives

All the six cooperatives that supply milk to the chilling plant do use their own vehicles for transportation for its members. Information from the secretary manager Metkei Cooperative society was that Metkei Cooperative has two canter Lorries which they use to collect milk from its members, It also has a tanker with a 10,000 litres capacity that it uses for hire to the chilling plant and other cooperatives when large volumes of milk are needed for transport to the processors. Milk are loaded in 50 litres stainless containers and are collected from 72 collection points daily. Metkei has a total of 700 registered farmers and collects milk from at least on average 600 farmers daily throughout the year as some may not be having milk due to dry herd. The secretary manager further said that on average a volume of 3200 kg of milk is delivered daily by Metkei to the chilling plant making it the transporter that delivers most of its milk to the chilling plant. It charges the farmers Ksh 2 per every kilogram of milk it delivers to the chilling plant. The chairman Kipsaos cooperative society shared the same view with Metkei, only that they charge Ksh 3 per kilogram which is determined by distance and volumes they deliver.



Picture 3: on the Left is Metkei cooperative milk tanker for hire.

Picture 4: on the right is Metkei cantor Lorries off-loading empty containers after milk delivery to the chilling plant.



Kipsaos Cooperative has only one lorry for transport of milk, and it transports on average 200 litres per day from on average 150 members daily.

Individual farmers groups

Individual farmer groups who cannot access transport services from cooperatives do have an agreement with a transporter. One such transporter interviewed was Mr. Jackson Kiplagat Tarus (see picture 4), a young man of 20 years old who bought a motorbike and transports milk for Testai self-help group, which is a group of 12 members. He said that he transports 80 -100 Kg of milk for a distance of 17 Km daily, and he is paid Ksh 3 per kilogram of milk delivered to the milk chilling plant. The price was similar to 4 other individual transporters using motorbikes within the region.



Picture 5: On the left is an Interview with Mr. Jackson Kiplagat Tarus a transporter for Testai Self-help group.

Private transporters

These are dairy farmers who owns pick –up vehicles and apart from transporting their own milk are contracted by his neighbours to transport for them as well. An interview with the plant manager indicated that there are two such transporters delivering on average 1800 Kg of milk daily (see picture 5 below).

Picture 6: on the right is a private transporter delivering milk to the chilling plant

Extension services

Interview result with the DLEO outlined that Metkei dairy farmers are organized into dairy groups at village level known as the Dairy management group (DMG), this groups are assigned extension staffs that offer training and support services on four packages; Milk quality, Artificial



Insemination, Dairy cattle feeding and Animal health. The MMC also has employed 10 extension staff each manning one of its 9 of its operation zones with the extension manager charged with overseeing the rest.

4.2.5 The role played by Metkei Multipurpose Company in value chain development

The overall interview result of 9 different stakeholders involved in MMC gave a dairy value chain indicated in figure 8 below. *(For a bigger picture see annex)*

Figures 9: Metkei Division Dairy Value Chain Map

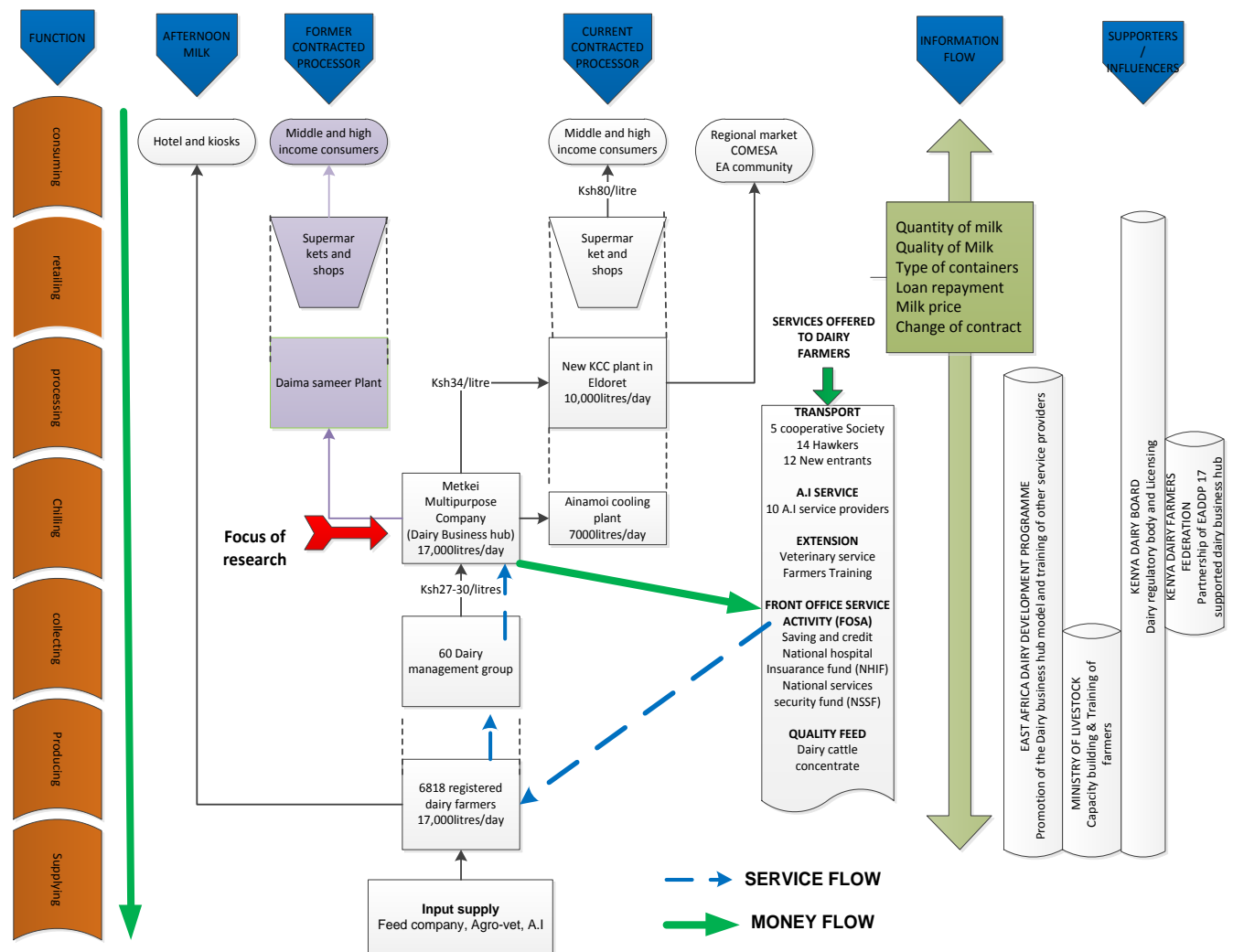


Table 3: Stakeholder analysis of Metkei division - Keiyo south

	Stakeholder	Key function	Influence/power
Actors	Bunda Feed Company	Supply feed only to the registered dairy farmers with the MMC.	Low
	Metkei Agrovets shop	Supply farm inputs and drugs to all dairy farmers in the area, get supplies from different feed manufacturers	Low
	Small scale producers	Produce milk mainly for household use and for sale	Low
	Dairy management groups	Collection and bulking of milk at the village level	Medium
	Cooperative societies	Collect and transport raw milk from members to chilling plant. Payment are made through them for its members	Medium
	Metkei Multipurpose company (MMC)	Information storage, chilling, quality control and transport of milk to the processor. Negotiate and sign contract on behalf of its members	high
	New Kenya Cooperative Creameries (NKCC)	Quality control, Processing, grading, Packaging and whole selling. They mainly control the formal sector	High
	Supermarkets	Sale only processed milk and milk products. Targets mainly medium and high income consumers	Low
	Milk bars, Kiosks and shops	Sales afternoon raw milk	Low
	East Africa Dairy Development Programme	Strengthening of farmer groups, offer training and capacity building of the management, Operationalize the dairy hub and establishment of chilling plants, oversee financial flows and link the MMC to microfinance institutions, banks, processors and other dairy service providers.	medium

	Ministry of Livestock Development	Advice, linkage, information dissemination, farmers training, health services and quality control.	low
	Ministry of Cooperative development	Advice, certify and oversee election within the cooperative societies.	Low
	National Environmental Management Authority (NEMA)	Look into the environmental safety and issue of environmental safety certificates.	Medium
	Kenya Dairy Board	Control and regulation of dairy industry, offers operation certificates to MMC and transporters	High
	K-rep microcredit	Offer interest free loan to MMC	Medium
	Cooperative bank	Offer commercial loan to the MMC	High

Coordination and Influence

An interview with the EADDP representative, Ms Jackline Chepkoech, indicates that coordination of the whole milk value chain is done by Metkei Multipurpose Company, as they form the link between the producers and the suppliers. The company coordinates transport including assigning of the route which transporter school takes, they also coordinate services such as A.I, cattle health and feed supply as all these services are paid through check off system from the dairy farmer's delivery at the chilling plant. The company also negotiates for better price with the processors for its members. EADDP still influences part of the companies operation has it has its member seating in the board of directors of the company, as it offers advice and oversee business operation within the company to ensure that the company has enough cash flow to offset loans used for initial capital and run at a profit.

Information flow

Information of quantity, price, quality and time of delivery is done on a day to day basis by the company automation system (see section 4.1.3.1), generating an immediate summary sheet indicating the farmers supply number, the farmers name, quantity of milk delivered and the time of delivery (see picture 6 below).



Picture 7: On the left is a dairy farmer leaves the chilling plant with a summary sheet on his left hand indicating information of his day delivery.

An interview with the 2 cooperative society officials revealed that the society gets the report on behalf of its members which it latter passes on to its members.

Apart from the milk information system, Metkei Multipurpose Company (MMC) also shares information by use of Dairy information system (DIS). This system on interview with the MMC extension manager has both the farmer information as well as the cow information, included for the farmer information is the farmers name, his location, the support from the MMC and the training he has undergone, while for the cow information is the cows name, registration number, the picture, breed, the sire, the dam, number of birth, amount of milk. This information is freely shared between the MMC and the farmers as well as EADDP, but the policy of the company withholds some information to an outsider. According to the DLEO Metkei division, the information are updated frequently from the farmers themselves and the divisional extension team.

Quality control

An interview with the famers and the plant manager outlines that quality control starts right from the farm, which is monitored through the DIS and milk information system (MIS). Plastic containers were confiscated upon the delivery of milk by the farmers and a check off for stainless steel containers given, an observation to milk collection point within the catchment areas of MMC indicated no plastic containers in use (See picture 7), but an interview with farmers suggest that they still use it for milking after thorough washing but for milk collection.

Picture 8: On the right are stainless steel containers at milk collection point.



Simple test of organoleptic and lactometer test are done at the milk collection at the village level, before loading of milk for transport by the MMC trained field staff or the transporter. On arrival at the cooling plant the same tests are done. Similar tests are done at the platform in the chilling plant before milk is accepted in the plant and it is known as platform test. Other confirmatory tests are also taken especially when a milk delivery is suspected and it takes 10 minutes before result are out. The procedures for the test and the expected results are openly placed on the walls for the client to see (see annex).

Information from the plant manager indicates that payment are not made according to quality but plans to implement it soon, as MMC milk is preferred by most processors since it is from organic feed and most processors mix 10kg of MMC milk with 50Kg from other areas. It is this high level quality standard that the MMC is in the process of signing a contract with a milk international organization called Nestle foods limited.

In order to improve on quality the MMC is shortening the distance taken from the farm gate to the chilling plant by installing satellite coolers. One of such coolers has already been installed in Timor along Metkei – Eldama ravine route. Information from the plant manager indicates that the MMC plans to install 4 more satellite coolers.

Milk Price

Milk price is based on the market price and the contract agreement. An interview with the farmers and the plant manager had it that the price offered to the chilling plant is Ksh 35 per kilogram (Ksh 33 for raw milk, Ksh 1 for chilling and Ksh 2 for transport). Part of the money is used to service the loans on initial capital and payment of the employees of the company, the farmers have a take home of Ksh 30.80 for individual farmers while members of cooperatives vary from Ksh 27 - 28 after deduction of transport cost to the chilling plant depending on the distance.

The company has its mission of increasing income among the dairy farmers and therefore the term of engagement among the processors is highly based on price. The term of engagement with the processors is three months, and either it can be renewed or terminated.

Logistic

Transport services play a major role in logistic of MMC, see 4.1.3.2. Milk are collected at village by farmers in small containers in small containers of 2 to 5 litres which are poured into one labeled collecting tank to allow in traceability based on the DMG. Milk are collected as from 6.00a.m according to information from secretary manager Metkei cooperative society (MCS) in the morning and should not be delivered to the chilling plant latter than 4 hours from the point of collection. Milk is kept below makeshift milk collection shade (see picture on quality control) at the village level before being loaded by transporters to the chilling plant

An interview with the quality manager MMC revealed that in the chilling plant milk are weighed and chilled in a 10,000litres cooling tank to a temperature of 4⁰C, which is transported the following day by the MMC tanker to the processor. Raw milk above the 10,000litres is not chilled but transported directly to Ainamoi cooling plant which is a New KCC processor owned cooler of which a company has a contract with as from 18th May, 2012. Not so it is transported director to the processors factory located in the nearby town which is approximately 100Km from MMC.

Sustainability

Organic Milk

Information from the plant managers is that MMC milk is organic and that it has high demand by processors because it is used to bled milk from other areas using 10Kg of MMC against 50Kg of others.

Limited Liability Company

The initial capital of the company was got through; 10% from shareholders by giving Ksh 2000 each as one share, 30% was interest free loan which represent Ksh 8million from K-Rep bank, and Ksh 8Million equivalent of 60% from cooperative bank which is to be repaid at a commercial rate interest of 12%.

Report from EADDP interview stated that the K-rep loan is deducted from the proceeds of milk and it is repaid after 3 years, while the commercial loan is from milk profit. Information from the plant manager gave a breakeven point of 14, 000 Kilogram of milk daily with a profit margin of

Ksh 2 per kilogram of milk delivered, and he suggested that this was possible through the dairy farmer's willingness to deliver all their milk meant for market to the chilling plant.

Price agreement

The MMC negotiates price contracts with the processors on behalf of the dairy farmers, and they look for fair price and fair conditions. Interview of the board members gave the current processor New Kenya Cooperative Creameries (NKCC) as a buyer of 'last resort', meaning that they offer higher prices and the quality parameters are easily achievable and thus rule out a guaranteed minimum returns of not less than Ksh 30 per Kg of milk which according to the company is a fair price for farmers to be able to plan for their finances within the period of the contract

4.2.6 Success factors of Metkei Multipurpose Company (MMC)

Organized farmer groups

The MMC have organized farmers group right from the village level to the divisional level. A village may have one or more DMGs of which each should have 15 members. It is in this group that services which determine a hub model are implemented. In that case each DMG member has a feed trainer, quality control person, an A.I person and an Animal health person each in charge of the whole DMGs within the location.

Stakeholder's participation

The mission of MMC is marketing, and it is doing this mainly through stakeholder's collaboration and coordination. Through collaboration more dairy stakeholders have been brought over board in Metkei division; Kenya stud book, animal breeder's societies and financial institutions, and through the chilling plant they have their services coordinated with the DMGs who are the major shareholders and suppliers of milk to the company.

Automated information system

Through its computer management system (DIS), the MMC acts as a custodian to the individual dairy farmer information which has; farmer information, dairy cow information and the milk delivery information. This helps the farmer to access his own information as well as other stakeholders who are interested in implementation in a particular field area be it production or marketing.

Market innovation

"Metkei has remained on board as the most successful dairy business hub in Kenya," said the plant manager, it scooped the top award on productivity and quality under the KIM annual business award (KABA) (*see picture 9 below*)

Picture 9: Certificate award to MMC in participating in 2011 DFBA



4.2.7 Limiting factors of Metkei Multipurpose Company

Cooperatives personal interests

Cooperatives have a fear that their roles will be fully taken by the MMC, an interview by the District cooperative officer indicated that the chilling plant has taken the marketing role of the cooperatives and cooperatives are only included in the board by members but not officials, this has threatened the cooperative to pull out .

Changing weather pattern

The plant manager MMC stated that the fluctuation in volumes of milk delivered to the chilling plant is mainly attributed to fluctuating weather pattern, the average 13,000 kg per day received during the research period he attributed it to the prolonged dry spell the previous year. He further said that the changing weather pattern also leads to milk glut and this does not only affect their profits but also their agreement since the processors since the processors use reason on quality to lower their price.

Competition with other chilling plant

According to the plant manager the coming of Chepkorio dairies as a milk collection hub has reduced the catchment area for its milk intake, which to an extend he sees it as a future challenge in terms of volumes for the company.

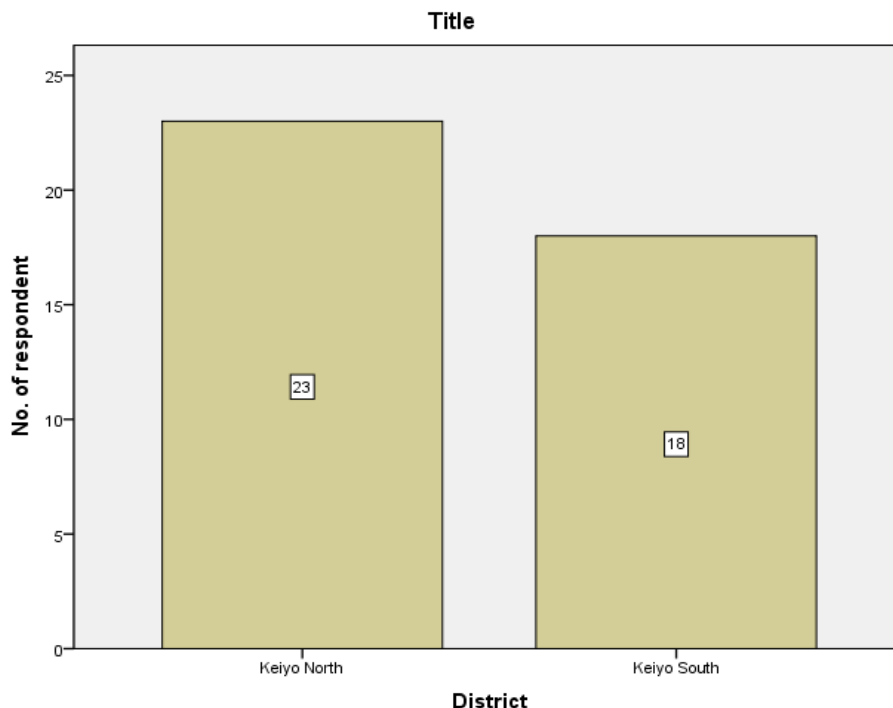
CHAPTER 5 RESULT OF SURVEY

This section outlines the findings based on the response of interviewing 40 farmers from Keiyo North and Keiyo South districts. The results make comparison based on gender, age, Choice of marketing and simple gross margins. The results are presented on bar graph, pie chart, tables as well as gross margins.

5.1 Respondent based on district

Out of 41 farmers interviewed 23 were from Keiyo North and 18 were from Keiyo South. An equal number of both male and female were chosen from a list at the divisional office and the chilling plant, but 4 females interviewed in the presence of their husbands were not willing to answer questions and they let their husbands do it.

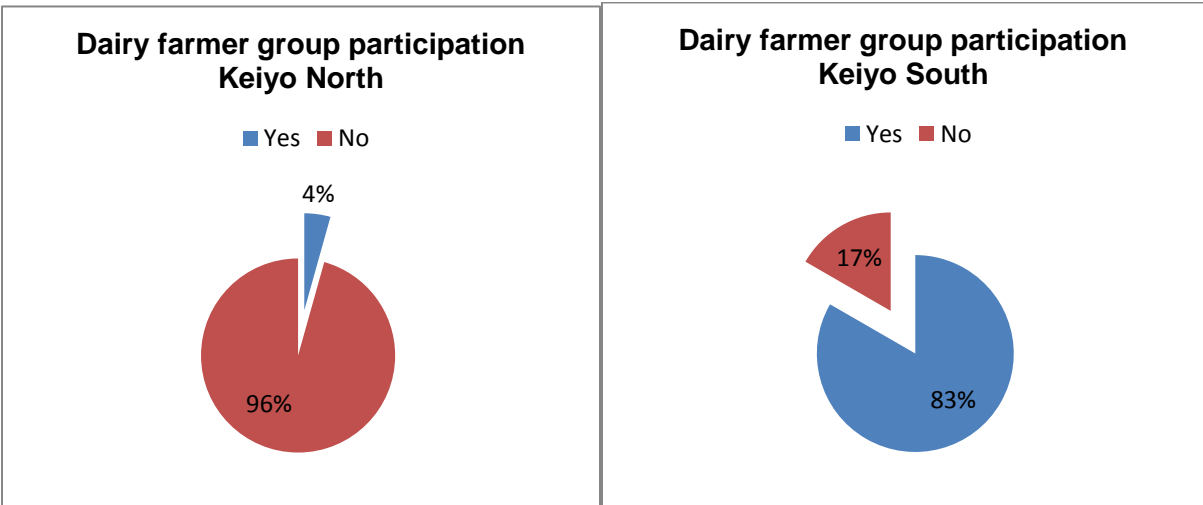
Figure 11: Keiyo district respondent based on district



5.2 Group membership

4% of dairy farmers are members of a group in Keiyo North and 83% are members of a group in Keiyo south (see figure 12)

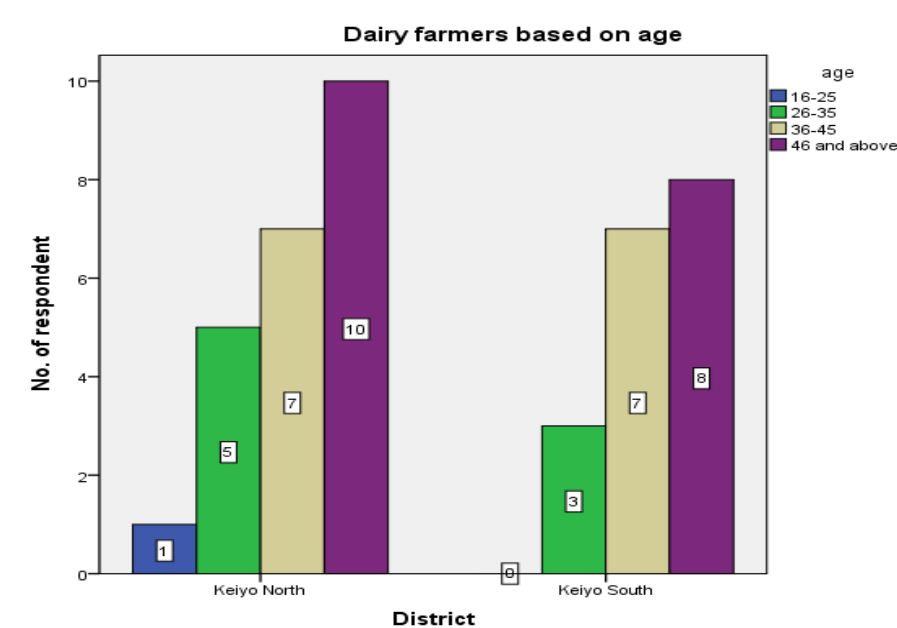
Figure 12: Keiyo dairy farmer group



5.3 Respondent based on age

The graph in 4.1.2 shows number of dairy farmers increases with age in both districts, ages between 16-25 have virtually no dairy but on observation are the majority in milk transportation (see figure 13).

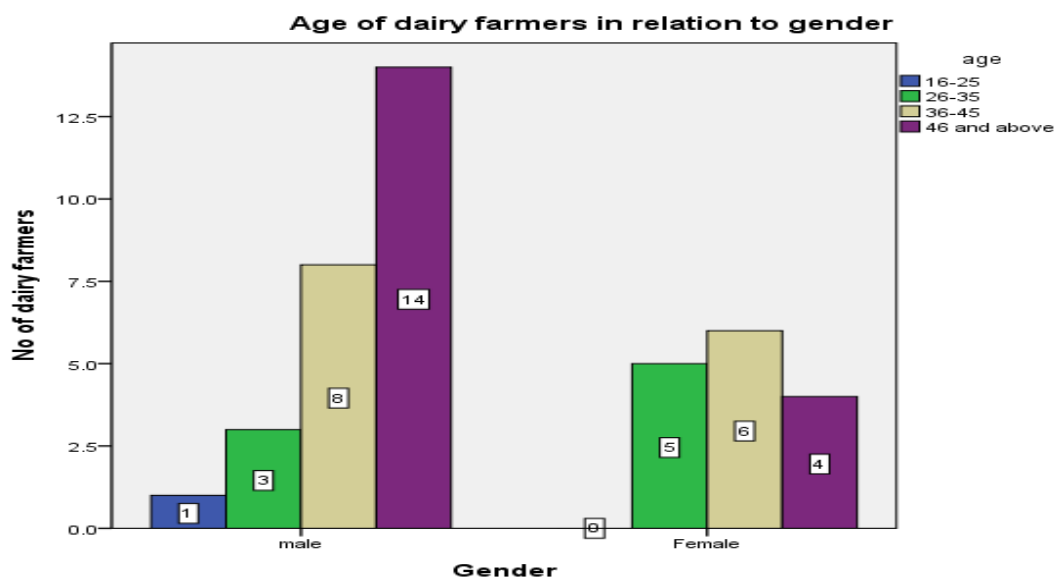
Figure 13: Graph of dairy farmers based on age



5.4 Gender age in relation to dairy farmers

The graph in 4.1.3 shows the number of dairy farmers increase with age for male, while for female it increases to an ages of between 36 to 45 and then it starts decreasing. At an earlier age of between 16 to 25 both male and female have virtually no dairy cows (see figure 14)

Figure 14: Age of dairy farmers in relation to gender



5.5 Market destination preferences

Preferences on market destination was analyzed based on better price, prompt payment, extra services offered, market reliability and bargaining power

Price

36% of dairy farmers in Keiyo North feel that better prices determine their choice while 76% don't, while for Keiyo South 55% think that that better price determines the choice of market destination while 32 do not. The $p > 0.005$ (see table 3)

Table 4: Percentage rating of market destination based on price

	Rating of market based on price				
	Bad %	Satisfactory %	Good %	Excellent %	
Keiyo North	9	55	36	0	P=0.085
Keiyo South	5	27	50	5	

Prompt payment

27% of the dairy farmers in Keiyo North are satisfied that prompt payment determines the choice of their market destination while 73 don't, while for Keiyo South 50% are satisfied that prompt payment determine the choice of their market destination while 50% don't. The $p > 0.005$ (see table 5)

Table 5: Percentage rating of market destination based on prompt payment

	Rating of market based on prompt payment				
	Bad %	Satisfactory %	Good %	Excellent %	
Keiyo North	9	64	27	0	p=0.054
Keiyo South	11	27	17	33	

Extra services offered

36% of the dairy farmers in Keiyo North are satisfied that extra service offered determines the choice of their market destination while 63 don't, while for Keiyo South 27% are satisfied that extra service offered determine the choice of their market destination while 61% don't. The $p>0.005$ (see table 6)

Table 6: Percentage rating of market destination based on extra service offer

	Rating based on extra service offer				
	Bad %	Satisfactory %	Good %	Excellent %	
Keiyo North	9	54	36	0	P=0.469
Keiyo South	50	11	16	11	

Market reliability

81% of the dairy farmers in Keiyo North are satisfied that market reliability determines the choice of their market destination while 18 don't, while for Keiyo South 83% are satisfied that market reliability offered determine the choice of their market destination while 5% don't. The $p>0.005$ (see table 6)

Table 7: Percentage rating of market destination based on market reliability

	Percentage benefit based on market reliability				
	Bad %	Satisfactory %	Good %	Excellent %	
Keiyo North	0	18	45	36	P=0.006
Keiyo South	5	0	5	78	

Bargaining power

0% of the dairy farmers in Keiyo North are satisfied that bargaining power determines the choice of their market destination while 99% don't, while for Keiyo South 50% are satisfied that market reliability offered determine the choice of their market destination while 39% don't. The $p > 0.005$ (see table 8)

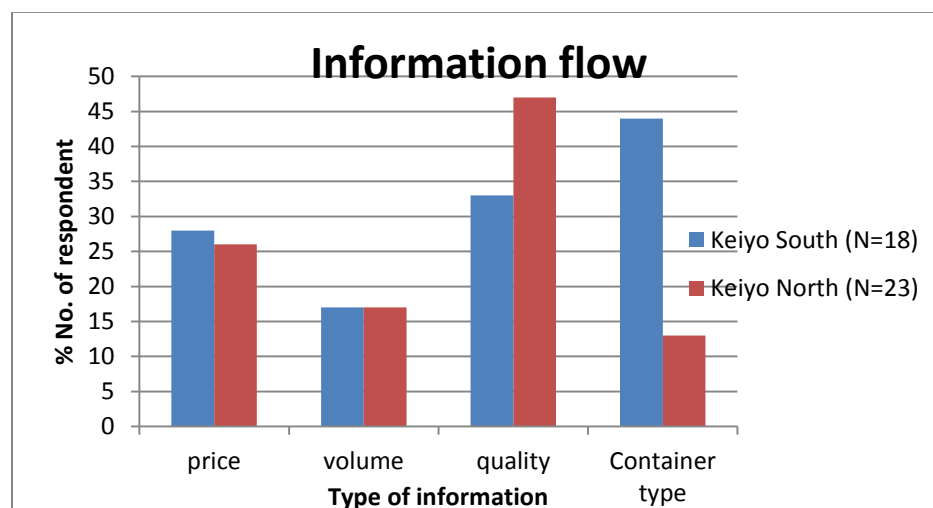
Table 8: Percentage rating of market destination based on bargaining power

	Percentage rating based on bargaining power				
	bad	satisfactory	Good	Excellent	
Keiyo North	90	9	0	0	P=0.004
Keiyo South	39	0	39	11	

5.6 Information flow

Information flow in figure 15 shows both Keiyo North and Keiyo South are below 50% among the respondent. Quality information was more received in Keiyo North than Keiyo south, while container type was more to Keiyo South. The volume requirement by the consumers was the least information received by the dairy farmers in both district, while for prices farmers in Keiyo North has a slight edge over those in Keiyo South.

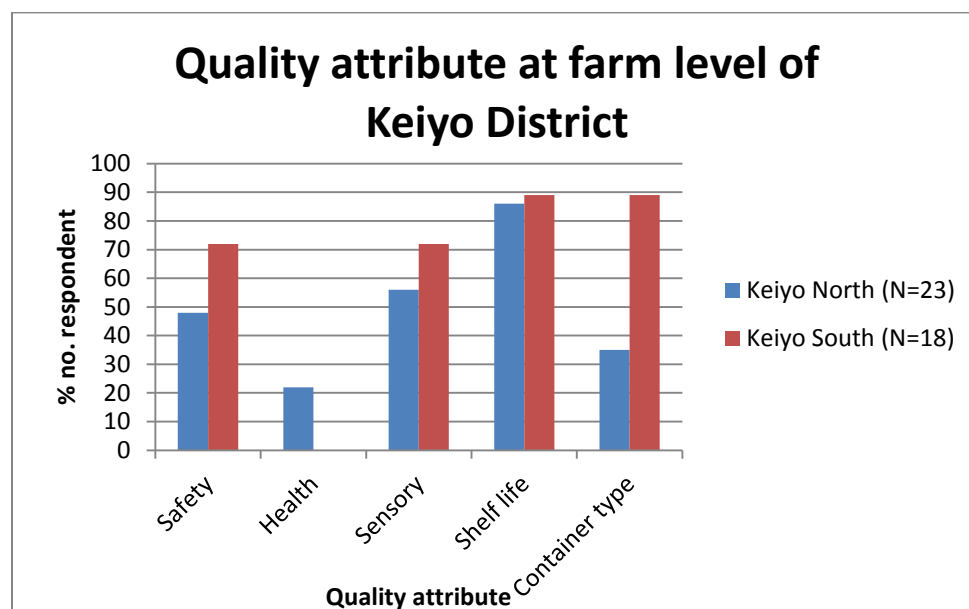
Figure 15: Type of information accessed by dairy farmers



5.7 Quality measures considered at farm level.

Farmers in Keiyo South are implementing quality measures in their farm more than farmers in Keiyo North with shelf life and container types accounting for 90%. For Keiyo North containers type is not considered as an important part of quality attribute in the farm. (See figure 16 next page).

Figure 16: Farm level practiced quality attributes



5.8 Gross margin for dairy farmer

Profit share is divided between dairy farmers, MMC and processors in Keiyo south, while for Keiyo north the traders come into play (*see table 9*).

Table 9: Gross margin for Keiyo dairy farmer per month

	Keiyo North	Keiyo South
Variable cost	Ksh	ksh
concentrates	750	750
oat seeds	0	120
Spraying/dipping	300	300
Deworming	100	100
Mineral licks and vitamins	400	400
Hired labour	1600	1600
Total Variable cost	3150	3270
Milk Revenue		
Milk sale	3660	3480
Milk consume at home	915	870
Total revenue	4575	4350
Gross margin/cow/month	1425	1080

Cow production 4 Kg per day – Keiyo North and 6 Kg per day Keiyo south

CHAPTER 6: DISCUSSION

This section presents discussion and argument based on results from data collection of case study and field survey in Keiyo district, it presents the dairy situation in Keiyo North and what lessons can be learnt from Keiyo south to enhance dairy development in the region.

6.1 Overview of dairy situation in Keiyo North

The interview information obtained from the district livestock officer Keiyo North district categorizes the highland as a predominant dairy zone, and according to the district livestock annual report of 2011 there are a total of estimated 17,500 dairy animals in the district with an estimated 3,500 small holder dairy farmers in the district (Bore, 2011) of these figures Kamariny division accounts for 9,200 dairy cattle and produces well of 50% of the total quantity of raw milk in the district, and therefore made it an ideal site for the interview as it was representative of the whole district. Though Metkei has approximately twice as much the number of dairy cattle as Kamariny, DLPO report from Keiyo South district indicates it produced 3,155,152 litres in 2011 which is about five times what Kamariny produces. Most of the figures in Keiyo North are estimates and therefore unreliable while due to automated system in MMC a more accurate data is obtained.

6.2 Group organization

Dairy production in Keiyo North district is dominated by small holder dairy production having between 1 to 5 dairy herds. The research has find out that farmers in Keiyo North operates individually and less than 5% are members of dairy group, this gives them a less bargaining power and are easily exploited as selling of milk is in cash or weekly basis, milk being the only source of recurrent revenue (Technoserve, 2008) it is used by farmers in Keiyo North district to fund their daily income need, which according to this research farmers find it insufficient and relate it to less pay, The low market group formation contribute to low access to market outlet which according to the research of Bolo (Bolo, 2011) leads to less stakeholders involved in dairy development in the district as compared to their counterparts in Keiyo south.

6.3 Milk volumes

The low volumes of milk as indicated in section 5.1 above coupled with lack of group cohesion in Keiyo north district has led to low cash flow , a report from the DLPO Keiyo south annual report of 2012 (Kendagor, 2011) shows double the number of livestock Metkei has compared to Keiyo north Kamariny division, milk output in Metkei is five times that in Kamariny suggesting a more efficient production system exist in Keiyo south than Keiyo north, this has helped it maintain its cash flow and paid its off its loan which will be discussed later under finance in this report. The MMC has fully exploited economies of scale and has helped consolidate small holder dairy farmer milk volumes to a level that there is a more strong chain relation with the processors who are willing to pay more for the milk, which in turn is translated to a more bargaining power to improve the farmers income, a situation that is not fully harnessed in Keiyo North.

6.4 Source of funding

Keiyo North district farmers are over relying on donor support to start a dairy business hub. The annual district livestock report 2012 indicates that insufficient fund is the course of limited livestock development in the district. On interviews of the stakeholders involved in Metkei business hub the research found out that the source of funds is more of a mindset than a requirement, and this is what EADDP did in order to fund MMC. Based on information from KIT and IIRR on value chain financing (IIRR, 2010) EADDP was able to use the triangle of value

chain finance in agreeing on product flow, timing and form of repayment, liability of the loan, information flow and risk management. This concurred well with KIT and IIRR at the same time with information from the interview in this report;

- i) Product flow - All small holder dairy farmers with shares in the company will sell all their milk to the chilling plant
- ii) Timing and form of repayment: The interest free loan of 30% should be repaid after 3 years, while the commercial loan with an interest rate of 12% annually will be paid for a period of 5 years
- iii) Liability of the loan: This depend on collateral the MMC accrued from its share capital of 40%
- iv) Information flow: information was shared between the chilling plant and financial institution and EADDP sat as a member in the board to assist in financial flow
- v) Financial Flow: a check off system was employed during milk deliveries that enabled farmers pay the loans with interest

Using the carrot and stick method, EADDP made dairy farmers fund the business dairy model through their own by pulling milk and increasing income (see figure 10 below).

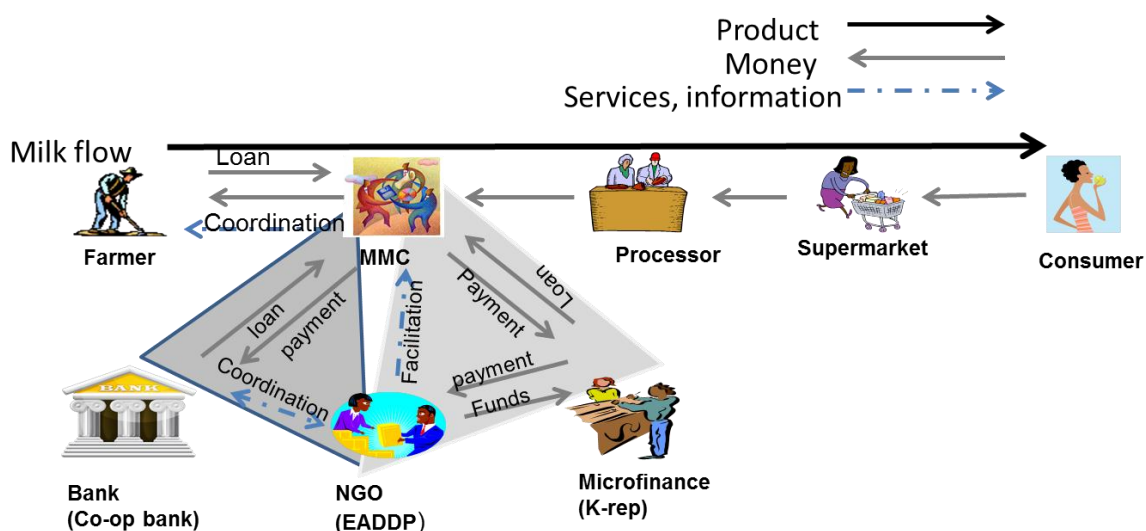


Figure 17 Milk chain of Keiyo south: two triangles

Source: IIRR 2010

An annex report of the EADDP under heifer international of 30th august 2007(international, 2008) indicated a budget allocation of Ksh 2.5 Million under investment capital for MMC, this concur with a Ksh 3 million interview result of this report taking in to account currency fluctuation in that the project was implemented in 2008, It is this amount that is given to K-Rep microfinance to loan MMC as an interest free loan and is paid directly through sale of milk as farmers share. This together with Ksh 1 million from individual farmers contribution accounts for 40% investment capital which according to KIT and IIRR makes it possible for the MMC to qualify for Ksh 6 million (60%) commercial loan under a 70% rule of not exceeding the value of a contract as collateral which it should pay latter from the profit accrued due to sale of milk at a commercial rate interest of 12%. This was a form of risk management and hence MMC being

referred to a limited liability company (see 4.1.5). From this information it indicates therefore the MMC actually funded its own business, a situation that Keiyo north needs to utilize the only thing it needs is a facilitator.

6.5 Profit

The survey result of the research shows that Keiyo North dairy farmers have a higher gross margin (GM) of Ksh 1425 as compared to that of Keiyo south of Ksh 1080, though this compares well with the national figures of Ksh 1500 as shown by the research report of Wambugu of the Tegemeo Institute of Agriculture on productivity trends and performance of dairy cattle in Kenya (Wambugu, 2011), the disparity of why the difference in GM between farmers of Keiyo North and that of Keiyo South is not clear, but can be attributed to the high milk price season at the period of data collection hence better price for Keiyo North than more stable price for Keiyo South. Confidentiality within MMC and that of processors making it hard to access financial documents and the research, a situation that is equally shared with Technoserve in their report on dairy value chain in Kenya (Technoserve, 2008), this therefore made the research to rely on estimates which might not be very accurate, this is an area for research that can be explored in future and come up with the real profit margin and value share between the actors of the value chain in Keiyo district.

However, from the economic point of view volumes due to economies of scale lowers operational costs and spreads risks which in turn increase profit, on the other hand milk consolidation increases competition among customers and due to market forces of supply and demand increase profits, this help foster value chain promotion that is outlined in valuelinks manual by GTZ (GTZ, 2007) as a way to improve the market share among the poor small holder dairy.

6.6 Information flow

Information flow in Keiyo North is not formalized, and the relationship between actors in the chain is based on trust which according to Technoserve report of value chain in Kenya of 2008 (Technoserve, 2008) leads to low reliability levels of 36% between dairy farmers and market destination for milk as stipulated from research finding in this report, this is far much contrary in relation to information in Keiyo south district, the use of automated system as indicated in sub section 4.1.3 in the chilling plant of MMC, together with the DIS shows that Information Technology (IT) is well utilized to determine volumes, price and quality status as such concur well with the world bank report of bringing agriculture to market (bank, 2008) which linked farmers in terms of inputs and market destinations. This is one of the reason that makes farmers from Keiyo south district fill more reliable with a 77% reliability with their designated market. However, as a result of the field survey less than 50% of the dairy farmers in Keiyo south acknowledge the receipt of information feedback, same applies to Keiyo north, suggesting that the use of DIS and daily milk information system has not been felt at farmer level.

Information of container type is more felt in Keiyo south, this is attributed to MMC policy of the use of only stainless steel and the company enforced this by confiscating unacceptable containers, while offering stainless steel ones through check off system.

6.7 Quality attributes

The quality attributes criteria used to assess the performance of dairy farmers in the two district of Keiyo south and Keiyo north was drawn from the food quality management book of Luning and Marcelis (Marcelis, 2009). The survey result of Keiyo North indicates that freshness of milk is the major quality attribute implemented at farm level before milk is marketed, other quality attributes of safety, nutrition level, sensory level are all intrinsic quality parameters that cannot

be clearly outlined from the research on the implementation level by dairy farmers, same is implied by dairy farmers in Keiyo South district, but observation and interview of various dairy farmers in the district, the use of stainless steel is highly considered mainly because of enforcement by the chilling plant and provision of credit facility for them to access and later own pay through the check off system on milk, a synergy that is seen to work well and can be employed by the processing company in Keiyo North district.

6.8 Market innovation

Keiyo North district has limited or no market innovation within its dairy supply chain, this can be attributed to limited number of stakeholders involved in the dairy value chain in the district. An interview with the divisional livestock officer of the area indicated that government ministries are the only available service providers that offer technical services to the dairy farmers, and due to their limited number and insufficient skills in business information, Keiyo North dairy sub sector has been left for market forces to take their level, unlike Keiyo South where the integration of the dairy hub business model is centered around the chilling plant, and this in effect has opened collaboration and partnership among the actors within the value chain since payment and information flow are all made through the chilling plant. This allows for actors to do business from one point thus reducing the operational cost and increase profit. It has also brought in banks, insurance companies and hardware store into the business, which are activities not related to dairy but serves the dairy farmer. However, the research found out that the new type of market orientation has helped strengthen some organization and weakened others, the cooperative societies feel threatened as their marketing role is taken by the MMC, and hawkers have lost business while some have resulted to being transporters. Product orientation is realized through volumes, chilling and transport in an efficient and effective way which according to CBS news of December, 21st of 2010 on the launch of Michael porters new article on rethinking capitalism the next major business transformation, can be seen to improve business among the actors in Keiyo South.

6.9 Farmer information

The selection of interviewees was evenly distributed 15 Km around the chilling plants in both districts, and with the selection of farmers to be interviewed done at random from the divisional list taking into consideration equal representation at the 3 locations, the sample was representative.

The result indicated older men than women are engaged in dairy farming. A sample from the district indicates that 44% of the male dairy farmers are above 46 years of age while for female the middle age of between 36-45 year comprise of 40% among the female dairy farmers, youths between the age of 16-25 owns no dairy animals. This shows that dairy in both Keiyo North and Keiyo south district are age related enterprise, mainly due to the value attached to it as a saving and dowry payment which are roles destined for the old. The youths do own motorbikes and are engaged in transportation of milk. The old due to their experience were able to give trends and information related to dairy development.

70% of the dairy farmers practice semi intensive system of dairy production, a fact that is contributed mainly by age as older dairy farmers are unable to do more of intensive farming. In cases where the younger farmers are involved, Zero grazing is more practiced.

6.10 Market destination and benefit

Choice of market destination by Keiyo south farmers indicated that price, prompt payment, reliability and bargaining power are the reasons more as to why they take milk to the chilling plant as compared to farmers in Keiyo north who prefer better services. On analysis of the

result, test revealed $p > 0.005$ thus there is no significance difference in price, prompt payment and better service delivery among the farmers of both district, but there is significance difference in reliability and bargaining power between the farmers in the two districts.

An interview of individual farmers indicated that milk are accepted at the MMC chilling plant throughout the year in regardless of whether it is in plenty or not, thus making it more reliable unlike the NKCC which farmers view as accepting milk when it is dry setting tougher conditions during the wet period when it is in plenty. Individual farmers have no bargaining power due to less volumes of milk delivered to the processors, so for farmers to realize better bargaining power in Keiyo north there is need to enhance cooperation through groups or cooperatives.

It can there for be seen from this discussion that integration of the dairy business hub in Keiyo North district is a factor to be considered in order to improve and enhance competitiveness in the dairy sub sector of the region.

7.0 CONCLUSION AND RECOMMENDATION

This section draws its conclusion and recommendation based on case study result, survey and the researcher observation, part of information from grey literature has also been incorporated.

7.1 Conclusion

Dairy situation in the larger Keiyo district is dominated by small scale farmers who own between 1 to 5 milking cows, the importance of the dairy in the district cannot be overestimated such that virtually nearly every household has a dairy cow. Most farmers practice semi intensive production system based on controlled grazing and semi zero grazing.

The enterprise is male dominated and particularly common among the old of well above 45 years of age, for the females it is between 35 to 45 years. The reason as to why the disparity is not known and there for calls for another area of research, but it is worth noting that there is division of labour at farm level with women taking charge of milking, while males are responsible for feeding, purchase and transport of feeds and drugs. The youth are mainly engaged in transport business.

Marketing appear disorganized in Keiyo north due to several marketing channels that exists, but in reality close observation reveals thrust among actors that have a long history of business together. The milk traders have their own customers same applies to the milk cooling plant, there are few supporters engaged in dairy business in Keiyo North especially those offering non-farm services such as credit, farm input and extension. The informal sector dominates the market due to the individualist approach exhibited by dairy farmers in marketing their milk produce, information flow and agreements are verbal with most farmers in Keiyo north considering milk freshness as the most important quality attributes feedback from the consumers.

The dairy hub business model is the one that controls marketing in Keiyo South. Centered on chilling plant marketing is coordinated and controlled by MMC, an organization of farmers who came together through their cooperative societies. The power of the company is based on milk volumes and value addition due to chilling which has helped build long term relationship among the stakeholders both actor and supporters, though for the milk hawkers they have been wiped out of business. However this has not really reflected to increased prices among the dairy farmers as the gross margin analysis shows an even lesser amount of Ksh 1080 compared to Ksh 1425 received by farmers in Keiyo north, reliability and bargaining power for the farmers are the factors which presented significance difference between the two districts of Keiyo North and Keiyo south hence the reason of preference of farmers to the DSBM.

The hub model has managed to establish close relations among the actors in the chain due to free exchange of information and offering quality products to its client. The automated system of information sharing and improvement use of recommended milk containers are imported areas that farmers from Keiyo North should learn from. The input suppliers, the producers and the processors can access products easily and in the right time either through check off system or contract.

The way the hub has marshaled services of credit, A.I, transport, NHIF and NSSF has helped improve the time as well as the welfare of the dairy farmers is an area that Keiyo North district should learn from, it has also created business to the stakeholders offering these services, but the impact on how this has transformed the lives of the dairy farmers in Keiyo south is not clear therefore recommended for future research.

The power of the company as it controls market in Keiyo south district risk swallowing up the cooperatives as it tightens its role in milk marketing that raises uncertainty among the cooperative officials and the district cooperative officer of the region. The reason behind this uncertainty is not known and there is need for more research in this area as this might determine the future of the hub business model in the area should individual cooperative pull out with its members and decide to be competitors with the chilling plant a future

7.2 Recommendations

On looking at the various results and information drawn from the dairy business hub system of Keiyo south district, the following recommendations can be passed to the various stakeholders in the larger Keiyo district;

- It is recommended that the ministry of livestock development Keiyo North keep an updated record that reflects the current dairy situation in the district. Use of modern electronic and information technology (IT) equipment like the DIS in Keiyo South would improve the storage and collection of data. This would in turn form a base of having reliable data that can be used for dairy development in the district.
- It is recommended that EADDP to scale up its operations to cover even Keiyo North, to help build farmer group and establish business institutions that can empower dairy farmers through improved dairy management, disease control and nutrition, they can also use their expertise to enhance dairy stakeholders participation in the region. This will help build the capacity and organizational set up of the dairy farmers which will see in to it that there is an improvement in milk per cow per day
- Keiyo North has already an existing cooling plant owned by NKCC with a capacity of 20,000 litres. It is recommended that instead of the district starting up with a new chilling plant which will cost time and money they can buy off NKCC. This can be done in such a way that the relationship between the dairy farmers and NKCC should be strengthened, such that farmers can still buy shares for the chilling plant and have a totally new elected board of directors to run the chilling plant on behalf of the farmers, and with NKCC seating on the board. The cost of the chilling plant can be paid from the profit accrued through sell of milk till come such a time that the shareholders can buy off NKCC.
- NKCC is recommended to enhance payment based on quality as this will motivate the dairy farmers to improve on their quality attributes at farm level in order for them to explore the opportunity available for them in the regional as well as international market. The use of modern information communication technology (ICT) equipment is also important for information flow and logistic.
- It is recommended for Kenya Dairy Board (KDB) to enforce quality regulation and link with dairy stakeholders of the region to build the capacity of the dairy farmers. It should also incorporate training of the hawkers on quality control measures and review the license fee charged downward so as it can be affordable to safe guard against hawkers who avoid their drag net and still sell unsafe raw milk to the consumers. It is also recommended that KDB invest on modern IT equipment such microchip that can be used as a bolus or an ear tag at farm level, which can enhance traceability.

REFERENCE

- BANK, W. 2008. Bringing agriculture to market.
- BOARD, K. D. 2012. Kenya Dairy Industry at a glance [Online]. Nairobi: Government of Kenya. Available: <http://www.kdb.co.ke/> [Accessed 29 2012].
- BOLO, A. 2011. Effectiveness of the value chain strategy in the selected producer-owned dairy groups in Kenya. *Prime journal*, 1, 93-100.
- BORE, W. 2011. Ministry of Livestock Development Keiyo District Annual Report. Ministry of Livestock Development.
- LEKSMONO, J. Y., N.HOOTON, H.MURIKI 2006. Informal Traders Lock Horns with the Formal Milk Industry: The role of research in pro-poor dairy policy shift in Kenya. 59.
- CHEPKOECH, J. 26th August, 2012 2012. RE: Dairy business hub model. Type to OMOLO, C.
- CHERUIYOT, A. East Africa Dairy Development Project. 1st e-dairy Conference, 2010 Safari Park-Nairobi.
- COMESA 2004. Regional dairy policy paper. In: COMESA (ed.). Nairobi: USAID/REDSO. Nairobi.
- DISTRICT LIVESTOCK PRODUCTION OFFICE, K. N. 2010. Keiyo North District Annual Livestock Production Report 2010. In: PRODUCTION, L. (ed.). Iten: Keiyo District Livestock Office.
- FAO 2011. Milk and Milk Products. Rome, Italy: Chief Electronic Publishing Policy and Support Branch Communication Division FAO.
- FORUM, K. D. A. S. 2011. Keiyo North Dairy Stakeholders Forum. 8th February 2011 2011 SARDEP HALL, Iten. Iten: District Livestock Production Office, Keiyo District.
- GTZ 2007. The methodology of value chain promotion.
- IIRR, K. A. 2010. Value chain Finance, Amsterdam, Riyal Tropical Institute
- INTERNATIONAL, H. 2008. EADDP proposal Nairobi: Heifer project international.
- KATHOTYA, M. N. A. M. 2012. Value-added coops giving smallholders a stable future. *Sunday Nation*, 8th July, 2012.
- KENDAGOR, M. 2011. Keiyo South District Livestock Report - 2011. Keiyo South District: Department of Livestock Production - Keiyo South.
- GOK. 2010a. Baseline Survey Report, Keiyo North Dairy Radio Roll Out Programme. Iten: Government of Kenya.
- GOK. 2010b. Kenya National Dairy Master Plan. In: DEVELOPMENT, L. (ed.). Nairobi: Government of Kenya.
- MARCELIS, P. L. A. W. 2009. Food Quality Management, Wageningen, The Netherlands, Wageningen Academic.
- MURIUKI, H. G. 2011. Dairy Development in Kenya. Rome: Food and Agriculture Organization.
- NATION, F. A. A. O. O. T. U. 2012. Milk and Dairy Product [Online]. Food and Agriculture Organization of the United Nation. Available: <http://www.fao.org/ag/againfo/themes/en/dairy/home.html> [Accessed 10th June 2012].
- NDUNG'U, W. 2012. Kenyan households hit by soaring milk prices. *The standard*, 7th march 2012.
- NJAGI, D. 2010. Kenya Dairy Sector Worth \$230million-study. *The East African*, 15th October, 2010.
- O'LAKES, L. 2010. Consumer milk quality perception / preferences. An assessment of willing to pay for quality. USAID Kenya Dairy Sector Competitiveness Program. Iten: Land O Lakes.
- OMORE, A. 2009. Integrating informal actors in to the formal dairy industry in Kenya through training and certification. *Agra Conference*. Nairobi: International Livestock research Centre.
- OPARANYA, W. A. 2010. 2009 Population and Housing census result. In: PLANNING, N. A. N. D. (ed.). Nairobi: Ministry of State for Planning, National Development and Vision 2030.
- RODUNER, D. 2007. Donor Intervention in Value Chain Development - Working Paper. 22.
- ROTICH, F. 2nd July, 2012 2012. RE: Manager. Type to researcher.

- STATISTICS, K. N. B. O. 2011. Population and Housing Census [Online]. Nairobi. Available: <http://www.knbs.or.ke/Constituency%20Population%20by%20Sex,%20Number%20of%20Households,%20Area%20and%20Density.php> [Accessed 31/5 2012].
- TECHNOSERVE 2008. The dairy value chain in Kenya. Nairobi: Technoserve.
- USAID 2012. MULTI-STAKEHOLDER EVALUATION OF AGRICULTURE AND LIVESTOCK VALUE CHAIN ACTIVITIES IN KENYA. Arlington, VA 22203: United States Agency for International Development.
- VERMEULEN, S. 2008. Chain-wide Learning for inclusive Agrifood Market Development, The Netherlands, International institute for environment and development (IIED), UK and the capacity development and institutional change programme, Wageningen University and Research Centre, the Netherlands.
- VERSCHUREN, P. 2010. Designing a Research Project, Hague, The Netherlands, Eleven International Publishing.
- WAMBUGU, S. 2011. Productivity trend and performance of dairy farming in Kenya. WPS 43/2011, 37.

ANNEX

Annex 1: Questionnaire for Dairy Farmers

District.....

Questionnaire No.

Name..... Gender (M/F)

Division.....

Location:

1. Where do you sell most of your milk?
 - ☐ Milk hub coolers (Metkei, Chepkorio)
 - ☐ Processor owned coolers (NKCC, Brookside)
 - ☐ Others
2. If others which once
 - ☐ Milk traders
 - ☐ Consumers
 - ☐ Retailers (Shop & Kiosks)
3. Why do you prefer the selected market above? Tick appropriately
 - ☐ Better price (Yes, No)
 - ☐ Reliable market (Yes, No)
 - ☐ Offer other Services (loans, extension, bonus) (Yes, No)
 - ☐ Near to me (Proximity) (Yes, No)
4. What volume of milk per day in litres are you selling to your market point, above?.....
5. What price are you selling a litre of milk now?
6. Are you satisfied with the price?
 - ☐ Yes
 - ☐ No
7. If no, what price range would you expect to sell your milk at per litre in Kenya Shillings?
 - ☐ 20-25
 - ☐ 26-30
 - ☐ 31-35
 - ☐ 36-40
8. Do you receive information of what type of milk your customer or consumer wants in the market?
 - ☐ Yes
 - ☐ No
9. If yes which information feedback you mostly get on your clients need?
10. a) Price (Yes, No) b) Volumes (Yes, No) c) Quality (Yes, No) d) Type of Container (Yes, No)
11. Are you aware of quality requirement by your consumer?
 - ☐ Yes
 - ☐ No
12. If yes, what quality attributes do you check for before marketing of your milk? (tick as appropriate)
 - ☐ Diseases, chemicals & antibiotics (Yes, No)
 - ☐ Nutritive Value (Yes, No)
 - ☐ Taste, odour & colour (Yes, No)
 - ☐ Freshness of milk (Yes, No)

☐ Use of stainless steel or aluminum containers (Yes, No)

13. Are your dairy product certified?

- ☐ Yes
☐ No

14. Are you a member of any farmer group?

- ☐ Yes
☐ No

15. If yes which one?

- ☐ Cooperatives
☐ Dairy groups
☐ Others

16. What is the main reason for joining the group in question 14 above?

- ☐ Marketing of milk
☐ Welfare and lobby group
☐ Funding and loans
☐ Social engagement

17. Are you a member of Metkei Multipurpose company?

- ☐ Yes
☐ No

18. From a scale of 1 to 4 can you rate the benefits of supplying milk to the cooler?

Better milk price	Prompt payment	Access to quality feed	Financial support	Readily available market	More bargaining power	Farmer welfare & lobbying

1) Bad 2) satisfactory 3) Good 4) Excelent

19. what makes you not join as member of the dairy business hub?

- ☐ It is not operating in this region
☐ High membership fee
☐ Tough quality regulation

20. What is your Education level?

- ☐ None
☐ Primary
☐ Secondary
☐ Tertiary

21. What is your age?

- ☐ 16-25
☐ 26-35
☐ 36-45
☐ Above 46

22. What is your land size in acres?

- ☐ 0 to 1
☐ 2 to 3
☐ 4 to 5
☐ Above 6

23. How many milking cows do you have?

- ☐ 1-5

- ☐ 6-10
- ☐ 11-15
- ☐ Above 16

24. What grazing system are you using?

- ☐ Zero grazing?
- ☐ Semi zero grazing
- ☐ Control grazing
- ☐ Open grazing

25. Where do you get your cattle feed?

- ☐ On farm
- ☐ Purchase
- ☐ Both

26. How much do you spend in Kenya Shillings on you dairy cows?

Cost of concentrates

Cost of Fertilizer and manure

Cost of fodder seeds

Cost of purchased fodder

Cost of acaricides and dewormers

Cost of minerals & vitamins

27. How much milk do you produce on average per day in litres?.....

Annex 2: Dairy checklist

East African Dairy Development Project Representative (Technorserve)

1. What is a dairy business hub model ?
2. For how long have you been promoting the dairy business hub model?
3. Where was the origin of dairy business service model?
4. Why did your organization think of adopting the dairy business service model?
5. What are the conditions required for the business hub model to operate?
6. How many models has your organization promoted so far? How many have succeeded? How many have failed?
7. What are the reasons for the failures, and what do you think can be done to improve on these failures?

Metkei multipurpose company (dairy business hub services)

1. For how long has it been in operation?
2. Why was the dairy business hub model established?
3. What success has been realized to date?
4. Who are the beneficiaries of this model?
5. What are the roles played by small holder dairy farmers and what are their benefits?
6. What are the challenges experienced by the model?
7. How is exchange of information passed from producer to customer/consumer?
8. What is your selling price per litre of milk?
9. What amount per litre do you give to the farmers?

10. How is the profit shared among the players in the hub?
11. How are small holder dairy farmers welfare operationalize in the organization?
12. What environmental consideration affects the organization?
13. What is the future plan of the organization?

The Milk trader

1. How long have you been in the milk business?
2. Which areas do you cover in milk collection?
3. How many other milk traders do you operate with in this area?
4. Why do you choose these areas?
5. How many farmers supply you with milk on daily basis?
6. How much do you buy a litre of milk?
7. What volume of milk do you handle on average in litres per day?
8. Where do you market your milk?
9. At what price per litre do you sell the milk?
10. What challenges are you facing in milk marketing?
11. Of what effect is the dairy business hub to your business?
12. What is the role played by government in your business?
13. What means of transport are you using?
14. How do you store your milk before marketing?
15. What type of containers are you using?
16. What quality attributes do you consider while getting milk from the producers to your customers?

The ministry of livestock development(DLPO Keiyo South)

1. What is your role in Metkei dairy business hub?
2. How is the dairy business hub benefiting the farmers of the area?
3. What is the effect of the hub in dairy industry in the district?
4. What is the relationship among the various actors before the establishment of the dairy business hub?
5. What is their relationship now?
6. What is the future of the dairy business hub in your district?

The Ministry of Livestock Development (DLPO Keiyo North)

1. How many small holders dairy farmers are in the district?
2. Which locations are the dairy farmers located?
3. Who are the dairy actors in the region?
4. What is the relationship between the various actors in the dairy value chain?
5. What are the various milk marketing channels available in the district?
6. Why are their existence of such chains
7. What is the role of the department on value chain development?
8. What are the challenges experienced in the improvement of value chain?

Annex 3: SPSS results findings

**Table 1: Market destination and price
ANOVA**

What price are you selling a litre of milk?

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	40.006	2	20.003	1.758	.186
Within Groups	420.938	37	11.377		
Total	460.944	39			

Table 2: Where do you sell most of your milk * Do you prefer the market due to price? Crosstabulation

		Do you prefer the market due to price?		Total
		Yes	No	
Where do you sell most of your milk	Milk hub coolers	18	0	18
	Processor owned coolers	1	10	11
	Others	9	3	12
Total		28	13	41

Table 3: Where do you sell most of your milk * Do you prefer the selected market on its reliability? Crosstabulation

Count

		Do you prefer the selected market on its reliability?		Total
		yes	No	
Where do you sell most of your milk	Milk hub coolers	16	2	18
	Processor owned coolers	11	0	11
	Others	8	4	12
Total		35	6	41

Table 4: Where do you sell most of your milk * Do you prefer the selceted market on other services offered (loans, extension bonus)? Crosstabulation

Count

		Do you prefer the selceted market on other services offered (loans, extension bonus)?		Total
		Yes	No	
Where do you sell most of your milk	Milk hub coolers	7	11	18
	Processor owned coolers	4	7	11
	Others	0	12	12
Total		11	30	41

Kruskal willis

Prompt payment

Ranks			
	Where do you sell most of your milk	N	Mean Rank
What benefit is propt payment?	Milk hub coolers	18	17.28
	Processor owned coolers	11	11.27
	Total	29	

Test Statistics ^{a,b}	
	What benefit is propt payment?
Chi-Square	3.727
df	1
Asymp. Sig.	.054

a. Kruskal Wallis Test

b. Grouping Variable: Where do you sell most of your milk

Financial support such as loans

Ranks			
	Where do you sell most of your milk	N	Mean Rank
What benefit is finacial support?	Milk hub coolers	18	14.14
	Processor owned coolers	11	16.41
	Total	29	

Test Statistics ^{a,b}	
	What benefit is finacial support?
Chi-Square	.525
df	1
Asymp. Sig.	.469

a. Kruskal Wallis Test

b. Grouping Variable: Where do you sell most of your milk

Price

Ranks			
	Where do you sell most of your milk	N	Mean Rank
What benefit is better price	Milk hub coolers	18	16.97
	Processor owned coolers	11	11.77
	Total	29	

Test Statistics^{a,b}

	What benefit is better price
Chi-Square	2.975
df	1
Asymp. Sig.	.085

a. Kruskal Wallis Test

b. Grouping Variable: Where do you sell most of your milk

Readily available market**Ranks**

	Where do you sell most of your milk	N	Mean Rank
What benefit is readily available market?	Milk hub coolers	18	17.97
	Processor owned coolers	11	10.14
	Total	29	

Test Statistics^{a,b}

	What benefit is readily available market?
Chi-Square	7.687
df	1
Asymp. Sig.	.006

a. Kruskal Wallis Test

b. Grouping Variable: Where do you sell most of your milk

Bargaining power**Ranks**

	Where do you sell most of your milk	N	Mean Rank
What benefit is bargaining power?	Milk hub coolers	18	18.17
	Processor owned coolers	11	9.82
	Total	29	

Test Statistics^{a,b}

	What benefit is bargaining power?
Chi-Square	8.364
df	1
Asymp. Sig.	.004

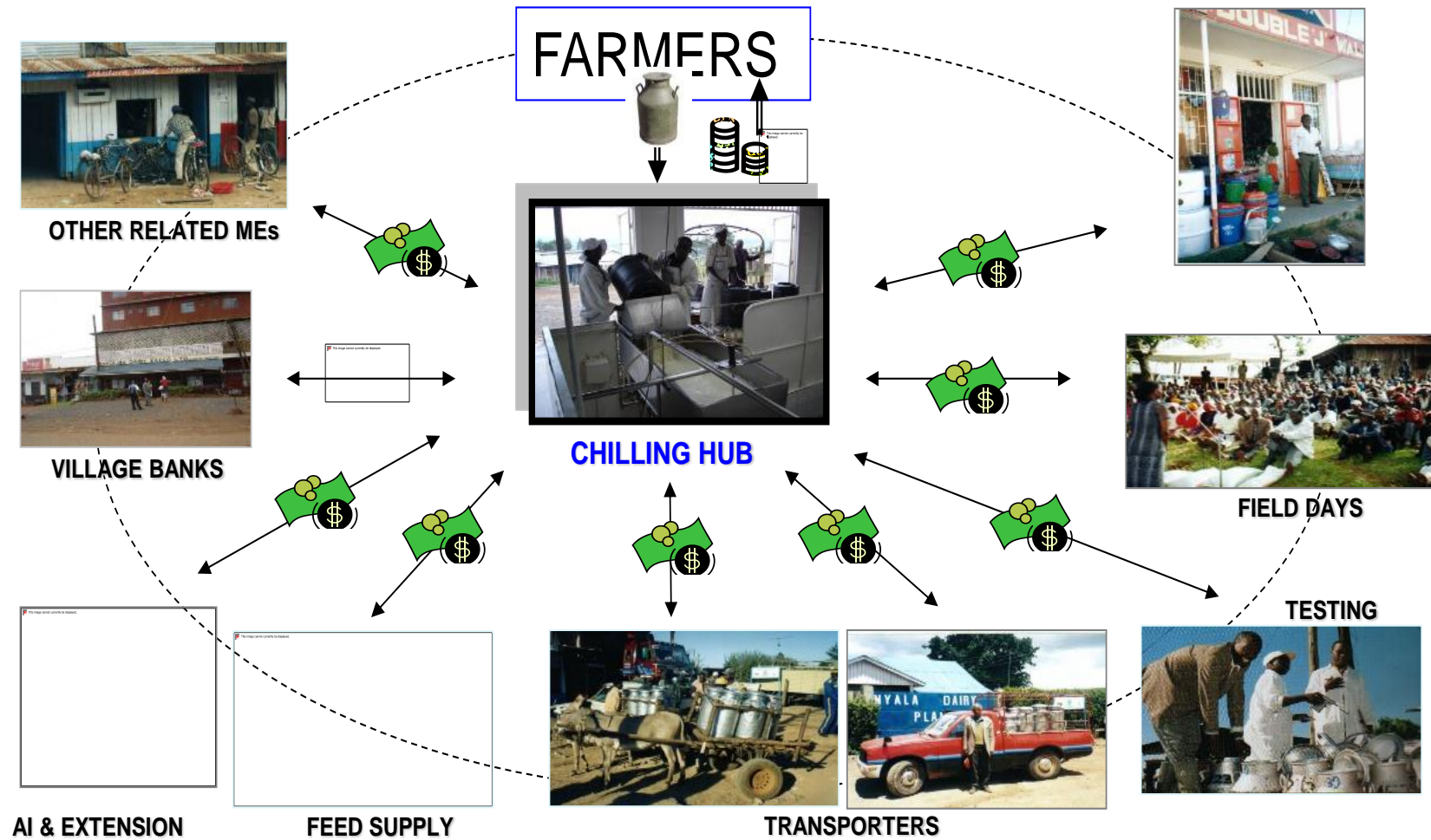
Test Statistics^{a,b}

	What benefit is bargaining power?
Chi-Square	8.364
df	1
Asymp. Sig.	.004

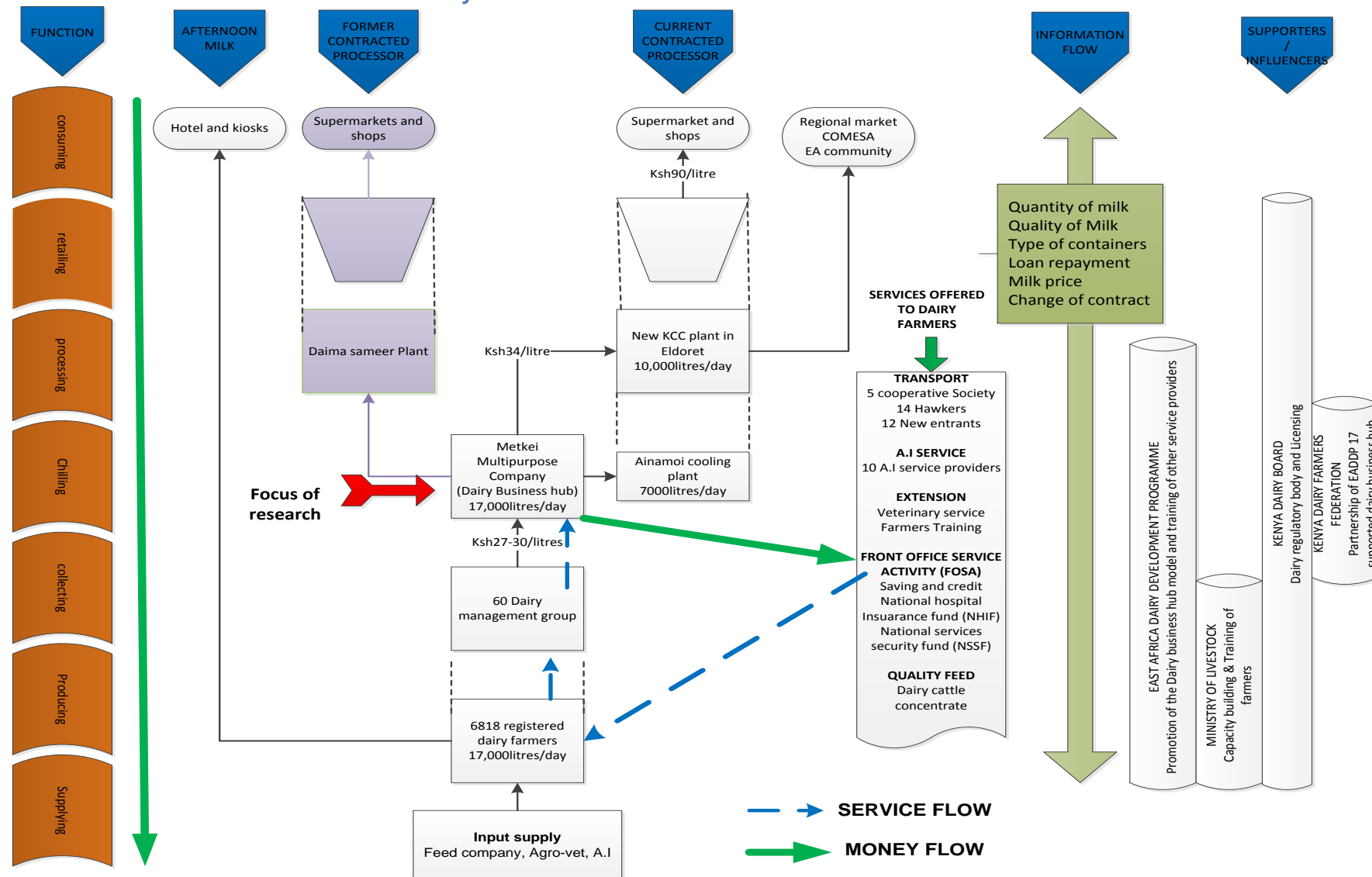
a. Kruskal Wallis Test

b. Grouping Variable: Where do you sell most of your milk

Annex 4: The Dairy Business Hub Model



Annex 5: Milk value chain for Metkei – Keiyo South



Annex 6: Milk Value chain for Kamariny – Keiyo North

