Factors Influencing Small-scale Farmers' Choice of Formal or Informal Raw Milk Markets

A Case Study in Gura Sub-location, Kenya.

Submitted March 28th 2014

LFKK10246U - Interdisciplinary Land Use and Natural Resource Management

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Key words: Dairy, raw milk, small-scale, formal, informal, marketing, Kenya, Central Highlands, Nyeri, Gura

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ABSTRACT

Raw milk marketing in Kenya is widespread and has induced an increased effort by the Kenya Dairy Board (KDB) to formalize the raw milk marketing chain due to health and tax concerns. However, attempts of formalization by the KDB have only been limited. This study aims to identify the factors that shape small-scale farmers' decisions to engage in formal or informal dairy marketing through a case study of Gura sub-location in the Central Highlands of Kenya. Specifically, this study finds that farmers' choice to sell their raw milk to formal channels is predominantly determined by monetary factors, namely the price, products and services offered on credit, and by non-monetary factors, such as the reliability of buyers' payments and recommendations from friends. Similarly, in the informal marketing channel, non-monetary factors including trust in buyers, social relationships, collection time in relation to those times offered by formal buyers' emerged as the most important, while price resulted as the main monetary factor influencing farmers marketing strategy. Furthermore, it is stated that farmers do not have complete knowledge about the variety of marketing channels and their prices, products and services offered. Additionally, several entry barriers has been identified, such as limited milk collection during evening times and no access to cooling facilities, inhibit farmers of selling their milk to formal marketing channels. This analysis suggests that government institutions such as the KDB need to take into account these factors in order to formalize the marketing of raw milk. Also, farmers are advised to organize themselves in order to improve their stake in the area. For instance, value-addition can be discussed between farmers to increase their margin.

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LIST OF ABBREVIATIONS

DFCS	Dairy farmer cooperative societies
FG	Focus group
GDSHG	Gura dairy self-help group
KDB	Kenya Dairy Board
LS	Life story
MWD	Mukurweini Wakulima Dairy Ltd.
New KCC	New Kenya Cooperative Creameries Ltd.
NMDA	New Mumwe Dairy Agribusiness Ltd.
ODCS	Othaya Dairy Cooperative Society
PO	Participant observation
SACCO	Savings and Credit Cooperatives
SHG	Self-help group
SI	Structured interview
SSI	Semi-structured interview
TW	Transect walk

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INTRODUCTION

Agriculture is the main source of income for the rural population in Kenya, providing a source of livelihood for approximately 75% of the population. Dairy production is an important component of the agricultural sector, as milk is the second commodity produced after tropical fruits and before meat and maize. Annual production of fresh milk from cows accounts for 3.7 million MT valued as US\$1165 million (FAO, 2012). 81% of the milk volume comes from small- and large-scale dairy cattle production systems present in different areas of the country, while the rest originates from indigenous cattle. Two thirds of the dairy cattle milk are produced by smallholders. Small-scale production is predominant in the humid and semi-humid zones of the Central Highlands, Rift Valley and Coastal lowland. Production takes place under zero-grazing systems as a result of high population density and scarcity of land in these areas (Bwonya, 1997). While one third of this volume is consumed on farm, two thirds are commercialized through different channels in the formal and informal market (Omore et al., 1999).

Since 1950, the Kenya Cooperative Creameries (KCC) became the exclusive organization of dairy product marketing, including processing and selling. KCC was a guarantor of milk purchases, price stabilizer and supplier of infrastructure (Owango et al., 1998). In 1992, the government introduced the liberalization of the marketing of milk by decontrolling milk prices and by dissolving the monopoly of the KCC. Government's intent was to open up the sector to private producers and processors in order to increase competition between market players, which ideally would result in the growth of producer prices, enhanced access to milk by consumers and an overall efficiency gain in the sector (Owango et al., 1998).

As a result of the dissolution of KCC's monopoly, the number of market players in the dairy sector in the formal as well as in the informal market increased. In the formal market, the government reestablished KCC operations. The now-called New KCC has been generally seen to have a substantial effect on the growth of milk processing without crowding out private market participants. Nowadays, about 30 licensed milk processors are listed, among those New KCC, Brookside, Spin Knit and Githunguri, who processed more than 80% of the formally marketed milk in 2008 (Muriuki, 2011). Farmers' organizations constitute an alternative model in the formal market (e.g. dairy farmer cooperative societies and self-help groups). For instance, the Othaya Dairy Cooperative Society (ODCS) buys milk from local farmers and resells it further to Brookside. Afterwards the margin is used to run the cooperative and to provide farmers' input. Owing to consumer demand, most of the marketed milk is raw, resulting in a reduced role of processors in the formal market.

In comparison, liberalization led to a growth of the informal market, in which milk brokers and vendors became important players and the main competitors to the cooperatives. These traders emerged and consolidated during the last two decades consequently to the liberalization of the national dairy sector. They currently absorb close to 60% of the marketed milk volume (Mbugua et al. 2012). Owango et al. (1998) conclude that the predominant transformation after the reforms in the dairy sector was a considerable weakening of the KCC as a milk marketer in favor of informal dairy channels that market unprocessed milk. Hence, although liberalization policies aimed to increase private dairy market participation, it led to a considerable enlargement of the unregulated informal raw milk industry. Additionally, real prices paid to producers increased significantly and the participation of cooperatives expanded substantially. Owango et al. (1998), however, link this to the unintended development of the informal market of unprocessed milk, partly due to the favoring of raw milk due to its lower cost and preferred taste.

Currently, a number of issues arise from the operation of the formal and informal milk commercialization channels (Mbugua et al., 2012). On one hand, the capacity of the formal dairy processing sector is underutilized. Only 30% of the 3-million liter processing capacity at the national level is satisfied, given the low volumes of raw milk delivered to processors through formal commercialization. On the other hand, quality and efficiency problems emerge from the lack of sanitary oversight and the deficient management of the cold chain along the informal marketing channel. Losses often result from spillage, lack of market, difficulty to reach the market (distance, transport infrastructure) and

rejection at market due to too high production (especially in the wet season) or to hygiene concerns. These problems lead to losses of up to 40% of the marketed milk volumes and to inconsistent quality in the dairy products reaching the final consumers (Muriuki, 2011). In this context, there is a need for a clear identification of strategies to make better use of the marketable milk produced by smallholders, as well as of a mobilization of smallholders into efficient marketing channels.

Research problem

The high share of milk commercialized through informal channels poses a challenge for quality control and for the minimization of losses in the Kenyan dairy sector (Mwangi, 2013). As a result, government authorities are working towards market formalization through training and registration of the informal milk brokers and vendors, as part of the National Livestock Development Policy and Vision 2030 (Mbugua et al., 2012). Furthermore, there is a need to regularly compile economic information about different marketing alternatives to ensure that relevant indicators are monitored and are available to inform decision making of small-scale farmers (Mbugua et al., 2012).

Thus, research that sheds light on the factors shaping small-scale farmers' decision to engage in formal or informal marketing channels, could be useful to assist policy makers to take informed decisions and design strategies for market formalization. Consequently, both livelihoods of small-scale dairy farmers and the national dairy sector could be strengthened. Likewise, a reflection on the cost and benefits incurred could help small-scale farmers select the most efficient marketing strategies in terms of high and reliable returns, reduced milk losses and sustainable practices, increasing farmers' motivation to further engage in dairy production.

The objective of this comparative study is to analyze small-scale farmers' decision-making to engage in formal and informal raw milk marketing systems, with Gura sub-location as a case study, and to understand the constraints and advantages of these systems. We aim to achieve this by identifying the differences in the main costs and benefits that function as incentives for small-scale dairy farmers to engage in each of these marketing channels. In this study, the definition by Mbugua et al. (2012) will be used, which describes the informal channel as being integrated by unlicensed hawkers, brokers, milk kiosks, bars and farmers who deliver raw milk to individual or collective consumers.

Research question

What are the factors influencing small-scale farmers' decision to engage in formal or/and informal raw milk marketing systems in the case of Gura sub-location?

Sub research questions

- 1. How are the formal and informal raw milk markets/market channels characterized in Gura sub-location?
- 2. What are the most important monetary and non-monetary cost and benefits for small-scale farmers to engage in formal or/and informal raw milk marketing systems?
 - a. What are the most important monetary cost and benefits?
 - b. What are the most important non-monetary cost and benefits?
 - c. From these costs and benefits, which are the main entry barriers for small-scale dairy farmers to gain formal and/or informal market access?
 - i. What is the role of associations (cooperatives, self-help groups, etc.) facilitating market access to small-scale dairy farmers?
 - ii. What is the role of small-scale farmers' spatial distribution facilitating market access to dairy farmers?
 - iii. What is the role of credit markets facilitating market access to small-scale dairy farmers?
 - iv. What is the role of gender facilitating market access to small-scale dairy farmers?
 - v. What is the role of value addition facilitating market access to small-scale dairy farmers?

Area of study: Gura sub-location

This study was undertaken in Nyeri South District, in Gura sub-location in the Central Kenyan Highlands (Figure 1). Gura sub-location includes 3911 inhabitants, spreading over 8 villages. It is an administrative division located above an average altitude of 1800 m.a.s.l with more than 1200mm annual rainfall mostly spread over two rainy seasons (from March to May and from October to November) with a growing inconsistency in the precipitation (Bwonya, 1997). It is well connected by a tarmac road crossing through most of the area, linking it to the urban markets of Othaya (6 km SW) and Nyeri (12 km N). Dairy production in the area is applied mostly in zero-grazing practices as a result of the high density and scarcity of land.



Figure 1. Main dairy infrastructures around Gura sub-location and Othaya, March 2014. Author: F.E.F Jean-Louis, University of Copenhagen.



Figure 2. Zero-grazing practice (left) and view of Gura sub-location (right). Photo: Karolin Andersson.

METHODOLOGY

Data collection occurred during twelve days in the field of Gura sub-location. Eight qualitative and quantitative research methods were applied (see Appendix I for full list), and data retrieved was used to triangulate and validate the results and conclusions (Mikkelsen, 2005) in order to provide an overview of incentives influencing dairy farmers' decision making to opt for informal or/and formal markets. This section describes the rationale behind method selection and application, including respondent sampling. Due to language restrictions, a local interpreter was used to facilitate the application of the methods.

Transect walk and resource map

Initially, a transect walk was carried out in order to locate small-scale dairy farmers in Gura sub-location. It provided a tool to observe spatial aspects faced by farmers (topography, infrastructure, distance and access to market and to the different stakeholders) and other factors that might influence small-holders' marketing choices (Mikkelsen, 2005).

The group divided tasks during the transect walk: two interpreters, a waypoint-taker with GPS-device, a sketchdesigner/observer, a facilitator and four note-takers/observers. A local guide was leading and navigating the group through the area. The first part of the walk was conducted from west to east where dairy farmers had direct access to the main road between Othaya and Nyeri (main towns, Figure 1) in the villages of Giathenge, Agakui, Tuurũ and Kiriko. The second part took a south orientation through the villages of Giathenge and Mutitu with farmers linked to the main road by dirt roads and steep slopes. Additionally, in order to keep track of the farmers' spatial distribution and the different infrastructures and other spatial factors influencing farmers in the choice of a channel, GPS waypoints were taken for each farmer who participated in questionnaires, structured interviews (SI), semi-structured interviews (SSI) and participant observations (PO). Waypoints were also recorded to locate actors in formal and informal marketing channels (processors, brokers, hotels and shops, milk bars, agro-shops) and veterinary services (veterinary clinic, cattle dip).

Questionnaire

A standardized questionnaire was distributed to 36 small-scale dairy farmers (see Appendix III) in the villages of Mutitu, Gitene, Agakui, Tuũrũ and Kiriko within Gura sub-location. Questionnaires contained open-ended and closeended questions in order to generate qualitative as well as quantitative data. A household level questionnaire was chosen in order to retrieve general characteristics of the formal as well as informal dairy market, such as market channels used and milk prices received. Distribution of the questionnaires was based on the coverage of five out of the eight villages within Gura sub-location. This was due to the inavailability of a complete list of inhabitants of the sub-location. Instead, village elders of the considered five villages generated a list of dairy farmers based on their knowledge about the population. By considering one third of the list of dairy farmers in each village (33 farmers in total), a random sampling strategy was employed by picking every third farmer from the list to minimize biased results and to be able to draw valid conclusions from the sample characteristics to the population within that sub-location (Woolridge, 2009; Babbie, 2010). Three additional small-scale dairy farmers were added to the sample, since these were identified from the transect walk and were given the questionnaire as well. However, the assumption of randomness of farmers chosen was kept. Hence, a representative sample for the dairy population was obtained, in which characteristics such as age, gender and number of cows was assumed to be representative for the five villages in Gura sub-location.

Structured and semi-structured interviews

Twelve structured interviews with farmers participating in seven different milk-marketing channels were conducted based on guidelines of Casley and Kumar (1988) and Mikkelsen (2005). The objective was to gain insight on the most important monetary and non-monetary costs, benefits and entry barriers involved in each dairy marketing channel from the farmers' perspective. Farmers were enquired about conditions in the marketing channel they currently participated in and their desire and capacity to participate in alternative marketing channels. A structured method was

preferred based on the need to obtain quantitative and qualitative information systematically from farmers in different marketing channels. Within the time frame available, at least one farmer from each marketing channel was selected to participate in the interview from the questionnaire sample. When possible, replications of the assessment for some channels were done.

Semi-structured interviews with the village assistant chief, Kenya Dairy Board (KDB), and representatives of seven different dairy marketing channels were conducted following the guidelines of Casley and Kumar (1988). The purpose was to characterize milk-marketing channels in the area from a milk buyer, regulator and authority perspective. Information was gathered on the number and characteristics of marketing channels, monetary and non-monetary entry requirements, prices, products and services offered and the relevant legal framework governing milk commercialization. SSIs were applied to obtain qualitative in-depth information from key informants of marketing channels in a comparable format. Given the time available, a single representative from each marketing channel was selected based on his/her position, knowledge of the channel and willingness to participate. Information on requirements, benefits and entry barriers obtained from interviews was triangulated with similar data elicited from the perspective of dairy farmers.

Participant observation

Participant observation is considered a qualitative research method to retrieve information about individuals' specific behavior and activities (Dewalt and Dewalt, 1998). PO was used in order to gain information about farmers' daily dairy related routines, milking procedures, various monetary and non-monetary costs and benefits in milk production, milk marketing, value addition procedures and intra-household labor division in dairy production. Through three participant observation sessions, farmers' dairy related activities were recorded and students actively observed and participated in milking of cows as well as milk handling. Farmers for participation were identified in the transect walk and chosen based on willingness to participate. In addition, milk collections were observed at local collection points, to observe milk handling practices during farmers' delivery and selling of milk.

Focus group

In order to gain in-depth knowledge about the dairy sector in Gura sub-location, its historic development has to be considered. Participants of a focus group (FG) were six village elders, which were identified by the sub-location's chief as having sufficient expertise about milk marketing in the area. In a semi-structured discussion, farmers' perceptions and views about the past and current role of different dairy market channels were discussed. In combination with quantitative and qualitative data from previously mentioned methods, the focus group gives the opportunity of triangulating and cross-checking information ("II. Overview of Focus Group Methodology", 2012). Therefore, the main aim of this method was to reveal farmers' perspectives and experiences in the milk sector by enabling a group discussion, which might be concealed by analyzing solely the questionnaire.

Life story

Ojermark (2007) defines life story (LS) as "the account of a person's story of his or her life, or a segment of it, as told to another". This method was meant to be applied with experienced female dairy farmers since part of the study concerns gender differentiated access to dairy markets. Gender was given specific focus since up to 50% of the agricultural labor force in Sub-Saharan Africa consists of women, and since women in agriculture generally have less access to formal market channels than their male counterparts (FAO, 2011). Life stories were used to get a perspective of how female dairy farmers in the area were affected by historical events, such as dairy market liberalization in 1992, New Constitution in 2010 and the crisis of Othaya Dairy Cooperative in the late 2000's. Triangulated with data from other methods, women's potential entry barriers to certain dairy market channels could be identified. Since information given by women tend to vary depending on male presence (Kitzinger and Barbour, 1999), and since it was thought that women might discuss more freely if they could speak alone, life stories with one women at a time were chosen. Identification of participants occurred through questionnaires and structured interviews.

RESULTS

Characterization of milk marketing channels

A larger number of formal and informal milk buyers emerged in the area after the liberalization of the dairy sector in 1992 (Source: FG). Table 1 describes some characteristics of these buyers. Current stakeholders in the formal market include, Brookside -the largest private milk processor in the country-, one cooperative (ODCS) and one farmer self-help group (Gura dairy, GDSHG) who deliver their milk to the New KCC cooling plant in Kiandu, and three milk collectors (New Mumwe Dairy Agribusiness, NMDA, Demka and Mukurweini Wakulima Dairy, MWD) who sell their raw milk to larger processors, final consumers or process it themselves. The informal channel is comprised by brokers and farmers selling directly to neighbors, schools and hotels. High female participation is a common feature of all channels. The registration requirements vary, but buyers in the formal channel require ID and bank account information because bank transfer is their main mean to accrue payment to farmers. Payment is usually done on a monthly basis. In contrast, the informal channel pays farmers cash on a weekly or daily basis.

Buyers in the formal market offer higher prices than brokers, as well as possibilities for price premiums for higher milk volumes delivered, products and services on credit, and free training and advice for farmers. These advantages are unavailable in informal channels. Most milk collected in formal channels is processed or sold to larger milk processors. During the study, ODCS was running at limited capacity allegedly due to defaulted payment from buyers and administrative complications. This translated into default in farmers' monthly milk payments during up to six months, eventually threatening the organization with collapse (Source: SSI, ODCS representative). By the end of the fieldwork, ODCS rallied funds in order to pay debts and reestablish regular operations.

According to the KDB (Source: SSI), formal requirements to sell and buy milk include the holding of an operating license and compliance of a list of hygienic milk handling regulations at the farm, collection point and cooling/processing plant. For example, transaction of milk must be done in a dust free area on cement floor into clean stainless or aluminum containers, milk has to be cooled within three hours from time of milking, and milk has to be tested for its quality before accepted by the buyer. Direct selling of raw milk to consumers is considered as informal; it is illegal, punished with charges and strongly discouraged by the KDB. According to the KDB, 80% of the milk is informally marketed in Kenya, and their goal is to decrease this percentage in order to assure safe production for consumers, create employment and to collect taxes.

Data from observations at farms and local milk collection points revealed that above mentioned requirements might not always be the actual practice. During observations at milk collection points, formal milk collectors such as NMDA, MWD and Demka did not do quality tests before milk was mixed in larger containers, and the area of collection could

not be considered as dust free. In SSI, however, all buyers except Brookside claimed to do quality tests on a random basis, thus observed absence of quality test may still not indicate informal practices. Further, it was revealed that regulations regarding selling of raw milk are not enforced but rather tolerated, due to lack of enforcement capacity and general preference of raw milk among consumers (Source: informal interview with local government official). Commercialization of raw milk to final consumers is done by buyers in the formal channel such as Demka and MWD.



Figure 3. Dairy farmers at milk collection point. Photo: Caroline Hambloch.

Table 1. Characteristics of the milk marketing in Gura sub-location.

	Marketing channel						
	Formal						Informal
	Brookside Ltd	Gura SHG	NMDA	ODCS	Demka	Mukuruweini	Broker
KDB registration	Dairy cooling and processing company	Milk collector self- help group	Milk collector	Dairy cooling and processing cooperative	Milk collector	Milk collector and public company	None
Number of farmers	No answer	67 (43 active)	30-40	11500 (150 active from all Othaya)	400 (50 from Gura)	4500 (120 from Gura)	35 (25 active)
Female participation	No answer	65%	70%	30%	65-70%	No answer	80%
Volume received	No answer	170 l/day	700-800 l/day (from all farmers)	500 l/day	1500 l per day (all farmers)	35000 l/day (all farmers)	80-100 I/day dry season; 170-200 I/day wet season
Registration requirements							
-Registration as seller	х		Х		Х	Х	Х
-Registration as member		Х		Х			
-ID and bank account information	х	Х	Х	Х	Х	Х	
-Membership fee		Х		Х			
-Acquisition of membership shares				Х		X (optional)	
Price paid (wet season)	32-40 ksh/l Othaya; 28	38 ksh/l	27-28 ksh/l	30-32 ksh/l	Price follows	29 ksh/l	Not answered
Price paid (dry season)	ksh/l collection points	38 ksh/l	32-35 ksh/l	34-35 ksh/l	Brookside pricing	33 ksh/l	25 ksh/l (from questionnaire)
Price premiums on milk quantity	-	5 ksh/l for volumes >1000 from New KCC	5 ksh/l for volumes >1000 l, from New KCC	-	-	-	-
Additional products and services:							
-Feed supplies, AI and veterinary services on credit deducted from payslip	x	х		Х	Х	Х	
-Discounts on input and service prices		Х		Х		Х	
-Free advice and training	x	Х	Х	Х	Х	Х	
-Cooling facilities for afternoon milk		Х					
-Buver signs as guarantor for loans		х					
-Other products on credit: biogas equipment						x	
staple food and personal loans						Λ	
-Cash advance in emergency situation							х
Buyers	Processed by self	New KCC	New KCC	New KCC, Brookside	Final consumers at	Final consumers at	Milk bars or final
				or processed by self	hotel in Othaya, schools, Brookside, processed by self	milk bar in Othaya, New KCC or Brookside	consumers in Othaya

Source: Semi-structured interviews with marketing channel representatives, unless otherwise stated.

Description of dairy farmers

Figure 4 illustrates the distribution of small-scale farmers into the different marketing channels for their primary and secondary market choice. The farmer's main and secondary channels are defined in terms of volume. In the main channel, 28 farmers (78%) sell their milk to formal market players, whereas 8 (22%) sell to informal channels. This distribution changes significantly when looking at the secondary channel, where the proportion of farmers engaged in informal market (neighbors, broker, hotel and school) increases to 85%. Specifically, the percentage of farmers selling to their neighbors differs considerably, from 11% to 75% in the main and secondary channel respectively. Participation in the formal market decreases notably in the secondary channel.



Figure 4. Distribution of small-scale dairy farmers into their choice of marketing channel. Red hues denote the informal channel. Source: Questionnaires.

Table 2 shows the farmers' participation in main and secondary channels combined. 15 farmers (42%) sell their milk exclusively to a formal channel (including main and secondary channel), while only two individuals (5.5%) sell all of their milk to the informal channel. Moreover, 13 farmers (36%) sell the majority of their milk to formal marketing channels, whereas the rest of their milk goes to informal market players. Contrastingly, only two individuals (5.5%) sell the greatest bulk of their milk to an informal channel and less milk to a formal channel. Finally, four individuals (11%) that sell their milk to informal buyers in the main as well as the secondary channel. In total, 21 farmers (58%) participate in the informal market as their main or secondary choice.

		Main channel					
		Formal	Formal Informal Total				
	Formal	1	2	3			
Secondary channel	Informal	13	4	17			
	None	14	2	16			
	Total	28	8	36			
Source: Questionnaires.							

Table 2. Farmers' main and secondary participation in formal and informal channels.

Table 3 describes different characteristics of the dairy farmers in the area of study, distinguishing between the formal and informal milk-marketing channels. In our sample, the average age of farmer is approximately 53 years for those who supply to the formal sector and 52 years for the informal one. However, the difference in age between the two sectors is not statistically significant Wilcoxon-Mann-Whitney test. This test is employed due to the small sample size, which does not allow for the assumption of normality (Bowerman, O'Connell & Murphree, 2009). Still, the relatively high mean evidences the issue of aging in rural farming in the area. It becomes apparent that Gura sub-location suffers from a demographic transition, in which young individuals tend to move to the cities (e.g. Nyeri or Nairobi) in order to look for non-agricultural work. Hence, farms, on average, exhibit relatively older individuals, who have to carry out the labor intensive agricultural work.

				Formal	sector					Informal s	ector		
Variable	Unit	Obs	Mean	Std. Dev.	Min	Max	Sig.	Obs	Mean	Std. Dev.	Min	Max	Sig.
AGE	Years	27,00	52,96	15,06	23,00	84,00		8,00	52,00	18,89	27,00	70,00	
cows	Number	28,00	3,18	2,96	1,00	16,00	**	8,00	1,50	1,07	1,00	4,00	**
LAND	Acres	27,00	3,57	2,87	0,25	12,00	*	8,00	1,97	1,20	0,75	4,50	*
RENT	Acres	28,00	0,94	3,35	0,00	17,00		8,00	1,50	3,47	0,00	10,00	
CONSUMP	Liters/day	27,00	2,06	1,24	0,50	6,00		8,00	1,94	1,08	1,00	4,00	
PRODDRY	Liters/day	26,00	4,93	3,25	1,00	13,00		8,00	3,81	3,51	0,50	12,00	
PRODWET	Liters/day	26,00	8,59	4,49	1,90	18,00		8,00	7,06	5,62	2,00	16,00	

Table 3. Summary statistics for the formal and informal sectors.

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(**) and (*) indicate significance at 5 and 10 percent, respectively, using a Wilcoxon-Mann-Whitney test.

Source: Questionnaires.

Furthermore, the average amount of cows (including calves) owned within a household is 3.2 in the formal sector whereas in the informal sector it is 1.5. The difference between these figures is statistically significant at the 5% level. The range in the number of cows varies as well between the sectors, i.e. a maximum of 16 cows is reported in the formal sector while this number drops to 4 in the informal one. Additionally, the average amount of land owned by farmers in the formal sector is 3.6 acres, while it is approximately 2 acres in the informal sector. This difference is statistically significant at the 10% level. The number of cows and the amount of land owned demonstrates the difference in wealth levels within the sample overall and within the two different sectors. 31% of farmers in the sample rent land. The average amount of land rented is 0.94 and 1.5 acres for the formal and informal sector, respectively. However, the maximum amount of land rented in these sectors is correspondingly 17 and 10 acres, which could be considered outliers. Excluding these observations, the averages of land rented decrease to 0.34 and 0.29 acres for farmers in the formal and informal market respectively. Hence, land rented seems to be only of minor importance for dairy farmers in the sample. Additionally, the differences in the averages were not statistically significant.

As expected, consumption of milk within the households does not vary between the two sectors, i.e. it is estimated at around 2 liters per household. However, average production in the dry and wet season differs somehow. In the formal sector, milk production per cow ranges from 4.9 liters in the dry season to an average of 8.6 liters in the wet season. In contrast, in the informal sector, production ranges from 3.8 liters to 7.1 liters of milk per cow; yet, the difference in the formal and informal sector is statistically non-significant. Differences in production between the wet and dry season can be partly attributed to the improved feeding conditions in the wet season as compared to the dry season.

Dairy farmers' costs and benefits

The monetary and non-monetary costs and benefits for farmers in the different marketing channels are shown in Table 4. Only the main market channel choice was considered in this section in order to simplify the questionnaire, since a lower volume of milk was traded in the secondary channel.

The main monetary costs to participate in the formal channel are for transportation and membership-related fees. The time to deliver milk to the collection place is the main non-monetary cost. While these costs are lower or absent in the informal channel, physical proximity, personal knowledge of and trust with the buyer are essential.

Note that some aspects considered benefits for the participants of one channel are considered costs for nonparticipants. For instance, non-participants consider the early pick-up time and distance to the collection points of some formal channels to be barriers for their participation, and prefer pick-up at the farm gate. Alternatively, nonparticipants consider the uncertainty about the broker reliability, inconsistent demand and the liquidity of the daily cash flow to be disincentives for participation in the informal channel. Participants of the informal channel consider this daily payment as a benefit. This contrast implies that farmers from the formal and informal channels differ in living conditions and financial requirements. Additional entry barriers restrict the participation of farmers in one channel or another. These include imperfect information and lack of trust in some actors of the formal channel, and lack of formal registration for buyers in the informal channel.

Concerning the benefits, the main monetary incentive offered by all channels to farmers is the price, which is considered by some farmers to be higher in the formal market compared to brokers. The formal channels offer in addition benefits such as transport compensation, price premiums, share dividends (monetary), lumped and reliable payment, discounts and credit facilities (non-monetary). Non-participants consider the formal channel to have potential to promote the local economy, as some buyers in this channel such as GDSHG and ODCS belong specifically to their geographical location and generate employment and income in the area.

	Formal	Informal
Monetary costs	Participants' perspective: -Transportation fee if is milk is picked up at collection point -Fuel cost if milk delivered at Othaya -Membershin fees	Participants' perspective: -None
	-Occasional requirement to buy membership shares	Non-participants: -Lower prices than formal channels
Non-monetary costs	Participants' perspective: -Time to deliver the milk to the collection point or Othaya	Participants' perspective: -Physical proximity, personal knowledge of and trust in the broker
	Non-participants' perspective: -Early pick up time -Distance to collection points -Mean of transportation to reach Othaya -Fluctuating prices	Non-participants' perspective: -Uncertainty about broker reliability for payment -Inconsistent demand (hotels, schools) -Delays in payment (neighbors) -Daily payment easily expendable
Other entry barriers	Non-participants' perspective: -Lack of information on delivery requirements -Lack of information about the existence and location of buyers -Perceived as buyers of large milk volumes only -Perceived as intermediaries between large processors -ODCS: Current debt to farmers, fears of mismanagement, perceived as not in operation	Non-participants' perspective: -Lack of formal registration
Monetary benefits	Participants' perspective: -Price -Transport compensation if milk delivered at Othaya -Price premiums for milk quantity	Participants' perspective: -Price

Table 4. Monetary and non-monetary costs and benefits for farmers in the milk marketing of Gura sub-location.

	-Occasional dividends from shares		
	Non-participants' perspective:		
	-Higher prices than in informal channels		
Non-monetary	Participants' perspective:	Participants' perspective:	
benefits	-Reliable payment	-Daily payments	
	-Lumped monthly payment	-Farm gate pick up	
	-Feed supplies, AI and veterinary services on credit, deducted		
	from pay slip		
	-Discounts on product and service prices-Free training		
	-Milk bulking		
	Non-participants' perspective:		
	-Perceived as local business that supports the local community		

Source: Structured interviews with farmers.

Among the monetary benefits, farmers in both channel consider price to be the most important factor for their choice of channel (Figure 5 and 6). In particular, the mean price in the wet and dry season in the formal sector is KSH30 and KSH33, respectively (Table 5). In comparison, in the informal sector the average price is KSH 29 and KSH33 in the wet and dry season, although the difference in prices is statistically not significant. The little variation between sectors could be attributed to the broad range of prices offered by different formal buyers, particularly if the milk is delivered in Othaya or picked up at the collection point, and also to the inconsistency of the recall period for farmers. However, it was observed that most formal buyers offered higher prices than some brokers, but that direct sales to neighbors could fetch even higher prices (approx. KSH40). Limited variations between seasons relate to the zero-grazing production season, as farmers can control the amount of feed provided to the animals.



Figure 5. Factors determining farmers' choice of buyer in the formal channels. Source: Questionnaires.



Figure 6. Factors determining farmers' choice of buyer in the informal channels. Source: Questionnaires.

_					Formal					Informal		
-	Variable	Unit	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
	PRICEDRY	KSH/liter	6	32,83	4,49	25,00	38,00	26	32,73	3,64	25,00	40,00
	PRICEWET	KSH/liter	6	29,17	7,25	21,00	40,00	24	30,02	3,39	24,50	38,00
	tionnairea											

Table 5. Milk prices in the dry (PRICEDRY) and wet (PRICEWET) season in the formal and informal sectors.

Source: Questionnaires.

The offer of products and services on credit was the second most important monetary factor in the formal channel. These facilities were met especially in MWD, GDSHG and Brookside, who provide in addition regular free training. In the informal channel, brokers offer cash advance and quack vets provide their service, however these "doctors" are unqualified and provide poor or incorrect information to the farmers (Source: FG).

Among the non-monetary benefits, buyer reliability in payment and friends' recommendation were the most important factors mentioned. It is expected that farmers give high value to payment reliability, particularly given the recent situation at ODCS, which affected many farmers in the area. Friends' experience with a channel seems as a reasonable measure of trust. In the informal channel, the non-monetary factor of personal trust in the buyer was the most important reason for farmers to engage, surpassing the importance of price (Figure 6). This is of particular relevance when payment is done in cash and no formal registry is established.

Collection time was mentioned by farmers in both informal and formal channels. While evening collection is the norm in the informal channels (Source: PO, SI and SSI), early morning collection time between 5.00am and 9.00am is practiced by the formal channels (except ODCS and MWD, not picking up milk at the time). A too early collection time is felt as a constraint for some farmers (Source: SI), especially the older ones. Volumes are referred to as an entry barrier, since a too low production would not allow the farmer to deliver the milk to the usual channel. In case of a relatively low volume, the neighbor is always favored.

A closer look at specific factors

The role of associations

Farmers associations operating in Gura sub-location were ODCS and GDSHG, which group 150 dairy farmers in Othaya location and 43 farmers in Gura sub-location respectively (Source: SSI). Particular characteristics of these associations compared to other channels are that they are integrated and managed by farmers with the specific aim to support their interests. Compared to the ODCS, GDSHG has a smaller number of members, was created directly by its participants, and is administered more horizontally. In both associations, members are required to pay fees to participate but can also benefit from dividends of shares. Both associations offer products and services to their members for dairy production at discounted rates.



Figure 7. Semi-structured interviews with GDSHG (left) and participant observation at milk collection point (right). Photo: Denisse McLean.

Of the farmers surveyed, a considerable share (22 farmers, 61%) participated in ODCS and a smaller share (8 farmers, 22%) participated in GDSHG. Four farmers (11%) were members of the two associations simultaneously, possibly as an alternative strategy to sell their milk given limited operative of ODCS. In fact, despite a large nominal participation, 90% of ODCS members (20 farmers) were delivering milk to other channels, leaving only 29% of surveyed farmers effectively marketing their milk through associations.

While 13 farmers (59% of ODCS members) alleged joining ODCS because it was the only dairy cooperative in the area before market liberalization, they also cited joining because they perceived benefits from associations, including the access to lumped, stable and higher payment. In GDSHG, access to better prices, services and lower expenses were mentioned as common incentives to join the group. According to association representatives, the milk prices offered to farmers were some of the highest in the area (Source: SSI). In contrast, 8 farmers (23%) cited mismanagement and default on payments as reason not to sell nor continue to sell their milk through ODCS (Source: Questionnaires and FG). For their part, 9 (25%) of surveyed farmers explained not joining any self-help group because they had no knowledge about the existence of an association of this kind in the area of study.

The role of farmers' spatio-temporal distribution

The study concerns an area quite well connected to a string of processing facilities (ODCS, Brookside and Demka in Othaya; KCC in Kiandu and MWD in Mukurweini) and close to large urban markets (Othaya, Nyeri, Nairobi) less than 3 hours transport from Giathenge village, the maximum time frame required by KDB for milk transportation without cooling to avoid microbial issues. The products and services mentioned by farmers as incentives to choose their main marketing channel are also more accessible in these urban regions.

_		Morning	Evening
	Brookside Ltd.	5.00-6.00	N.A.
	Demka	8.00-9.00	N.A.
Formal	GDSHG	5.00-6.30	N.A.
Format	MWD	5.00-7.00	11.45am-1.00pm
	NMDA	7.30-8.30	N.A.
_	ODCS	N.A.	N.A.
Informal	Broker	N.A.	From 3.00

Table 6. Milk collection times of formal and informal milk buyers in Gura sub-location.

Source: Semi-structured interviews.

The mean distance to the point of delivery was 1.2 and 1.1 km for the formal and informal channels, respectively. The differences between these figures were statistically non-significant. Rather, an important spatio-temporal factor mentioned by farmers was the collection time, which can be paralleled with the distance factor. As seen previously, formal channels pick up the milk at some specific point and most frequently early in the morning (between 5.00am and 9.00am latest). It is referred as a non-negligible entry barrier for some farmers (Table 6). Despite the high density of milk collection point on main and secondary roads (one every 500 m approximately, Figure 8), it still represents 15 minutes walk for an average distance of 1 kilometer on dirt path with stiff slopes. In addition pending spent at the collection point is time consuming (20 minutes of waiting time were observed during a PO).

Older or female farmers in charge of numerous children argue choosing informal channels as their main marketing channel because of the convenience of collection at the door (Source: questionnaire). Those farmers cannot delegate time to deliver the milk to a collection point. In addition, a proximity factor motivating channel choice was observed, which could be identify as a *neighbor effect*: It appears that many farmers choose a channel because their neighbors are in this same channel or they live close to a specific buyer (e.g. school, GDSHG). Thus, dissemination of information is often restraint to particular areas. Many farmers are not aware of the existence of certain channels (e.g. GDSHG) or ignore the actual prices offered by each channel within Gura sub-location.



Source: transect walk, resource map, interviews and questionnaires

Figure 8. Marketing channels in Gura sub-location. Author: F.E.F. Jean-Louis, University of Copenhagen.

The role of credit markets

When determining the decision-making process by small-scale dairy farmers, (non-) access to credit might be a crucial factor limiting or enabling farmers to enter the formal dairy market. Credit might be institutional, i.e. commercial banks and/or savings and credit cooperatives, or non-institutional, such as group-based lending, e.g. "Merry-go-round". Additionally, contract dairy companies, e.g. Mukurweini, might be able to provide credit for their customers. In our sample, 30.6% (11 out of 36) of the farmers use either form of credit mentioned above. Nine households receiving credit supply their milk to formal market, whereas two households supply to the informal market (Table 7).

	F	ormal secto	r	Infe	ormal secto	r
CREDIT	Freq.	Percent	Cum.	Freq.	Percent	Cum.
Yes	9	32,14	32,14	2	25	25
No	19	67,86	100	6	75	100
Total	28	100	-	8	100	-
		Source:	Question	naire.		

Table 7. Proportion of individuals receiving credit and not receiving credit in the formal and informal sectors.

It is important to distinguish between the different sources of credit. As shown in Table 8 and 9, only two households receive credit from institutional sources, such as banks and Saccos, one of them selling to the formal dairy market and the other to the informal. Farmers in the area face three major barriers to receive institutional credit. First, to open a bank account, farmers must prove consistent payments from their produce of a minimum of three months. Second, in Saccos, such as Wanincha or Taifa, individuals need to purchase shares to receive a loan from. In the case of Wanincha Sacco, a minimum of 50 shares (1 share costs KSH100) must be bought. Lastly, and more importantly, interest rates are fairly high, ranging from 16% per annum in Wanincha Sacco to 20% per annum in Equity Bank, making it more costly for farmers to invest in new assets, which could potentially benefit their dairy production.

CREDITTYPE	Freq.	Percent	Cum.
Bank	2	18,18	18,18
Coffee cooperative	2	18,18	36,36
Gura SHG	4	36,36	72,73
Merry-go-round	1	9,09	81,82
Mukurweini	2	18,18	100
Total	11	100	-
Source: C	Questionn	aires.	

Table 8. Distribution of type of credit overall.

In contrast to institutional credit, services on credit provided by milk buyers, i.e. GDSHG and MWD, was preferred by farmers. Veterinary services, artificial insemination and feeds/feed supplements can be retrieved by farmers on credit and gradually deducted from their paycheck. Additionally, MWD offers products on credit completely unrelated to dairy, such as cooking flour, which might be specifically targeted to attract more women dairy farmers. The variety of services offered by different formal marketing channels and the importance attributed to them by farmers, demonstrates the great demand for these credit facilities, and the competition between milk buyers in order to attract more dairy farmers.

	CREDITTYPE	Freq.	Percent	Cum.
	Bank	1	11,11	11,11
	Coffee cooperative	1	11,11	22,22
Formal	Gura SHG	4	44,44	66,67
sector	Merry-go-round	1	11,11	77,78
	Mukurweini	2	22,22	100
	Total	9	100	-
Informat	Bank	1	50	50
sector	Coffee cooperative	1	50	100
	Total	2	100	-
	Source: Questionn	aires.		

Table 9. Distribution of type of credit in the formal and informal sectors.

The role of gender

Data was triangulated from questionnaires, life stories with women and participant observations to examine the role of gender facilitating market access to small-scale dairy farmers. Table 10 shows gender distribution of selected variables from the questionnaire, which were thought to uncover possible gender differences in milk marketing. Equal amounts of women and men used formal (14) and informal (4) milk buyers as their main marketing channel; female farmers were on average 1.6 years older and used generally 1.5 minutes less time on delivering the milk to the main buyer than their male counterparts; nine women and eight men stated dairy as the household's main time consuming activity; and one woman and five men were said to access and use credit. Further, Table 10 shows that the distribution of buyers in some cases varied between men and women, for example three more women than men sold to Demka whereas more men than women sold to MWD. A small gender variation was observed regarding reasons for choice of the main marketing channel where price related reasons were mentioned more frequently among men than women.

		Women (<i>n=18</i>)	Men <i>(n=18)</i>
	Formal		
	Brookside	1	1
	Gura SHG	4	3
	Demka	4	1
Main marketing channel	MWD	4	6
	NMDA	0	2
	ODCS	1	1
	Total	14	14
	Informal		
	Broker	2	1
	Neighbor	2	2
	Hotel in Giathenge	0	1
	Total	4	4
Mean age		53.5 years	51.9 years
Mean time spent on delivering milk t	o buyer	16.0 min	17.5 min
Dairy as household's main time cons	uming activity	9	8
Access to credit		1	5
Poscon for choice of main	Good price	6	8
channel	Reliable payment	4	5
(no of times mentioned)	Products & services offered	4	5
(no or ames mentioned)	Convenient pick-up time	2	1

	Table 10. Gendered	distribution from	n questionnaire	information.
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Source: Questionnaires.

Data from life stories with female dairy farmers provided information on gender specific roles, local norms and women's rights. Women take care of milk production including feeding, milking and in many cases marketing, as stated by the woman participating in life stories. The same was observed during participant observations at farms and milk collection points, where mothers and sons did the milking and the majority of the farmers at milk collection points were old or middle aged women. According to the woman in the life story session, men were characterized as responsible for and in charge of the monetary tasks, such as going to the bank to get paid and buying and selling cows. Further, in most cases cows were said to be owned by male family members, which means that cows could be sold without the consent of the woman. However, according to the participating woman, there is a slow change in participation where women are increasingly included in household decisions. Gender roles are deeply rooted in the society and it was stated that despite increased judicial rights for women, *de facto* changes will come only when attitudes change. Further, it was stated that it is hard to distinguish a certain channel particularly convenient for women, but Demka was mentioned as an appreciated buyer, which may correspond to the higher number of women selling to Demka than men in the questionnaire. It was also mentioned that there is a need for a women's dairy association, since this could enable farmers to increase income through value addition.

The role of value addition

None of the farmers in the questionnaire were engaged in value addition practices. Main reasons for not processing were too low milk volumes to process, followed by lack of interest, lack of capital, lack of material (e.g. starter cultures for yogurt, equipment) and lack of processing knowledge. Lack of market/demand was yet a reason, but this argument may derive from a lack of knowledge. However, among eleven farmers, mainly from Gitene village, there was an interest in value addition of raw milk, particularly regarding yoghurt production. A few farmers thought that value addition could increase the income of the household and that there was a local and regional demand for yogurt. From the life story session with women it was claimed that establishment of a women's dairy group had the potential to pool processing knowledge and resources together, hence facilitating increased value addition practices with consequent income increase in the area.

Seven farmers out of 28 (25%) asked in the questionnaire claimed that they had access to cooling facilities. Three used refrigerators and three put the aluminum milk bottle in cold water over night (one respondent did not specify). The farmers who did not use cooling facilities claimed there was no need for it since morning milk was taken straight to a buyer while evening milk was sold to neighbors or used for direct self-consumption. From observations at milk collection points (NMDA, MWD and Demka) and visits by an informal milk broker, no use of cooling facilities by these buyers were noticed during pick-up from farmers. Regarding the milking practices, observations at farms showed that they were at times hygienically insufficient and did not comply with KDB regulations (Source: PO), possibly affecting consistent milk quality and quantity.

DISCUSSION

Farmers' participation in formal and informal marketing channels

Using the average number of cows and dry season milk production in the formal and informal markets, daily milk production for the 36 farmers in the sample was estimated at 321 liters. 63 liters (20%) would be sold to brokers, neighbors, hotels and schools through the informal market and 258 (80%) would go through associations and private processors through the formal market. While these are rough estimates based on a series of simplifications, they are far from corresponding with the estimates of 55 to 80% of milk marketed through the informal channel found in literature (Omore et al., 1999; Mbugua et al. 2012).

Potential reasons for this discrepancy are the proximity of Gura sub-location to the urban areas of Othaya and Kiandu, where collection plants from major processing companies are located. Gura location 164 km away from Nairobi, the largest net consumer of dairy products in the country, may explain the interest of processors in bulking milk from dairy farmers in these areas. The good condition of main and secondary roads linking small-scale farmers with collectors, cooling and processing plants may also facilitate formal market participation.

The emergence of a better pricing offer and the supply of cheaper dairy inputs and services was mentioned as the most perceptible change experienced by farmers after the removal of the KCC's monopoly (Source: FG). This change was allegedly due to competition between formal buyers for milk in this region. This observation was confirmed by the apparent little presence of brokers in the surveyed areas. Nonetheless, the percentage of farmers selling to the informal channel increased considerably when farmers' secondary channel was taken into account. Apparently, the informal channel systematically absorbs an -albeit smaller- portion of farmers' milk, even in locations that are considered well connected to formal milk bulkers and buyers. Given the conditions of households, since most of this milk corresponds to afternoon milking and is sold directly to neighbors (questionnaires and POs), it could be argued that the informal market plays an important role in the allocation of milk that cannot be sold immediately due to the absences of evening collection schedules, nor can it be properly cooled to be sold in the morning after.

Direct sells to neighbors offer a win-win situation as farmers can sell their milk at a higher price than that offered by formal buyers offer while neighbors can buy fresh milk from a known supplier at a lower price compared to processed milk. Therefore, the importance of the informal channel for afternoon milk commercialization, specifically through direct sell to neighbors, could also be considered demand driven. Furthermore, this model might be reinforced by the social relationship between the farmer and the neighbors, which could be valued higher by the farmer than an impersonal relationship with a formal marketing channel. Health considerations do not seem to affect this informal trade given the short distances between neighbors allowing for daily collection of small volumes of milk, and that most of the milk consumption observed in households is boiled in combination with tea.

Motivations for farmers to participate in formal and informal milk markets

An analysis by Staal et al. (1997) states that loss of trust and uncertainty in the milk payment by the New KCC were the main determinants of farmers to switch to informal channels, e.g. neighbors or brokers. These findings are in line with the findings of our study since farmers' preference of choosing the informal channel stems from two main motivations: trust in the buyer and price. Furthermore, findings of Owango et al. (1998) describe that higher prices in the informal market for neighbors seem to determine part of the decision to choose this channel, while Kaitibie et al. (2009) states that the informal marketing channel is chosen, amongst other, due to farmers receiving a higher price and consumers preferring the lower price as compared to buying it from a supermarket, which is confirmed in our evidence. However, it is important to distinguish between different informal channels, since brokers for instance offer generally a lower price than neighbors. Brokers seem to receive a relatively small amount of the marketed raw milk in our sample, which is confirmed by a finding of Staal and Shapiro (1994). In our study the informal channel also seems to

have less importance than the formal one. Concerning farmers engaged in the formal channel, they highly prioritize the price paid per liter and value the products and services offered on credit, especially veterinary services on shortterm credit (Owango et. al, 1998). The informal channels can hardly compete on this level.

Associations

According to FAO (2012), associations have the role to facilitate knowledge, inputs, and market access and dissemination for smallholder farmers. As described above, the associations in Gura sub-location offer additional dairy production inputs and services compared to non-associations. These benefits represent an additional incentive for farmers to group rather than selling as individual in the formal or informal channel. Both ODC and GDSHG sell their milk to the New KCC, one of the largest milk processors in the country. Thus it would be reasonable to sustain that associations, through their milk bulking capacity and production-based incentives, improve the access to the formal market for small-scale dairy farmers.

However, associations face substantial entry barriers deterring farmers' participation. As highlighted previously, barriers in this case include mismanagement issues resulting in lost of farmers' trust and imperfect market information about the existence and benefits of associations. It is also worth noting the limited presence of associations in the area and the relatively low share of farmers' participation. These observations correspond with the findings from Omore *et al.* (1999). These aspects highlight the importance of adequate governance in collective institutions, the need for complete information flow between seller and buyers in the dairy market and the potential for cooperatives and other forms of associations to continue filling the gaps in milk marketing after liberalization in the Gura smallholder dairy sector.

Credit

As mentioned before, there is only limited use of formal credit (i.e. banks and Saccos) in our sample, which might inhibit farmers on increasing their amounts of dairy-related assets, and thereby hinders them to increase dairy production and enter formal marketing channels. Three factors could be responsible for this result. First, individuals might lack information about possible credit channels and the requirements connected to them. However, this has not been mentioned in the questionnaire. Second, individuals might be unwilling to invest their resources in order to receive credit. As a result of the SIs with the farmers, it is evident that some individuals are reluctant to giving their possessions, e.g. cow(s) or house, as collateral. Lastly, individuals might be willing to receive a credit but are simply constrained or restricted to do so. As outlined by Eswaran and Kotwal (1990), assuming individuals are averse to risk, they would prefer to smooth their consumption over time either by smoothing their own wealth or by taking a credit for consumption. Hence, if the requirements to receive credit, such as the high interest rates, are too costly for farmers, risk management through institutional credit channels is not possible. Since interest rates are relatively high in this area, it might explain the high percentage of individuals attracted by products and services offered on credit by the milk buyers, which are easier and less risky to obtain.

In contrast to farmers selling their dairy to formal buyers, informal ones only have limited or no access to products and services on credit. Additionally, they exhibit less heads of cows per household and own less land. Hence, credit constraints for farmers in the informal sector are even costlier.

Gender perspectives

Our results indicate that gender seems to play a minor role for farmers' choices of dairy marketing channels, since no evident pattern in market channel selection could be distinguished between men and women. Although semistructured interviews with representatives of marketing channels showed that women are a majority in all marketing channels, it does not reveal who actually benefits from the marketing or who makes the decision on where to sell the milk. In other words, women's documented lack of market access (FAO, 2011) is hard to confirm in this study. However, as became apparent from the life story session as well as from observations, there is a strong division of labor between men and women in the community, where women do most of the dairy production as well as household work and in some cases other agricultural activities. In households with this uneven distribution of labor, agricultural productivity including dairy production may be lower (O'Sullivan et al., 2014), such as the households found in the informal sector. However, other factors than division of labor may determine the lower productivity in households in informal marketing channels. Additionally, observations and life stories indicated that women have little control over and access to the income of the household (FAO, 1996), including the income derived from dairy production, which may limit women's influence in dairy production and marketing decisions.

Space and accessibility

Regarding the influence of collection time, a study by Muriuki (2010) argues that times of milk collection could be a constraint to households. Specifically, there might be an inadequate offer of milk collection during the evening, which forces households to self-consumption or selling to neighbors. Thereby an entry barrier for households is created, which prevents them from selling their dairy to formal marketing channels. The finding by Muriuki (2010) would explain the high shift from informal to formal marketing channels, when considering the primary and secondary channel. In particular as becomes apparent from the results of the questionnaire, farmers tend to sell their evening milk to their neighbors, which could be a result of the observed lack of collection during the evening. Only Mukurweini collects their milk at around noon, which might partly explain their popularity within our sample.

Our research area is well connected by a tarmac road to cooperatives and companies in Othaya where are located Brookside, ODC and Demka, in Kiandu where is New KCC and in Mukurweini. Such a high accessibility to formal milk traders and the proximity to urban market explain the strong grip of formal market in Gura sub-location. The access to so many companies and cooperatives may ensure with the use of value addition a way for farmers to reach a bigger urban market in Nairobi, since raw milk market has a restraint range due to perishability (Owango et al, 1998). Value addition is an alternative to increase the extent of consumers that farmers could reach.

Value addition

Since no farmers in the study process their milk further, it was concluded that value addition does not seem to affect farmers' choice of marketing channel. However, results show an interest among farmers to initiate value addition practices, but processing equipment and knowledge is lacking. Consequently, there is a need for resource pooling through self-help groups or alike to increase value addition practices. This implies an incentive for NGOs and governmental institutions, who strive for increased formalization of the dairy market (Mbugua et al., 2012), to promote and support local value addition of raw milk as a means for market formalization.

Methodological reflection

Transect walk and resource map

In the transect walk, shortcomings refer mostly to the interaction with the guide. First, the method started with truncated information about the area and more precisely about the definition of the area. While originally the research concerned Giathenge, it was changed to covering most of Gura sub-location due to the limited amount of dairy farmers in Giathenge. Second, there was an issue in miscommunication with the guide regarding the type of dairy farmers visited. The first part of the transect walk only covered wealthier farmers established close to the tarmac road with well-fed cows. Nevertheless, this systematic error has been corrected on the second part by seeking farmers farther away from the tarmac road or even not directly linked to a road. Since the transect walk was used to identify farmers for the interviews and questionnaire, the sampling method had to be review to ensure a random sample.

Questionnaire

In the preparation as well as in the conduct of the questionnaire several limitations were encountered. First, difficulties were experienced in generating the random sample due to a lack of a population list within Gura sublocation. The time demanded was very high in order to identify the village elders, who were able to generate a list with dairy farmers within five villages out of the eight in the sub-location, which forced us to limit our analysis to these five. Consequently, the chronology of the methods applied was disrupted. Initially, it was aimed to first conduct a questionnaire, which can be used to determine farmers for the structured interviews. Instead, these farmers were identified from the transect walk, therefore our random sample of the questionnaire was extended by three individuals. However, the reverse order of the methods did not seem to impair the results obtained. Additionally, the list generated by the elders might have created some error, since they created the list from the farmers they know. Yet, it can be argued that this error did not affect our results since the characteristics of the farmers selected were relatively diverse in terms of spatial distribution, age, number of cows etc.

Second, the random sampling strategy brought its advantages and disadvantages. The main benefit of a random sample in our case is that it gives an idea of the relative importance of different characteristics within the population. For instance, formal market participation seems to be relatively low. A result of that, and simultaneously the main disadvantage, is that a small sub-group results for the informal market participants due to their low share in the sample. However, this can be managed by appropriate statistical tests, as outlined in the results section.

Lastly, some questions within the questionnaire were changed or added during the project in the field. For instance, questions about milk cooling and processing were included in order to get an overview of current cooling and processing efforts and of farmers' aspirations in processing their dairy. Moreover, difficulties were faced when asking the questions of milk prices and production during the wet and dry season. Possibly due to recall issues, the numbers might be inaccurate. Similarly, inaccuracies were met in the question whether the farmer receives any credit. As turned out after some time in the field, services and products offered on credit by milk buyers is more important than credit received from formal banks and Saccos. Yet, our question was primarily referring to formal credit institutions. However, the question was rephrased after the issue was realized, which gave important insights in the importance of credit offered by milk buyers.

Structured and semi-structured interviews

In the structured interviews with farmers, shortcomings relate to the limited number of cases obtained and the general difficulties to elicit personal preferences. The number of interviews was conditioned by time availability. This means that, in contrast to the questionnaire, SIs are not statistically representative but complement the questionnaire with more detailed information. Although we aimed to interview farmers from all marketing channels, we were unable to cover one of them and field logistics determined the location of the farmers. However, these issues did not affect the quality of our results significantly, as the SI was not exclusively about the one marketing channel farmers participated in, but about the farmers' views on all the channels.

It is difficult to ensure that interviewees consider all relevant variables when choosing their preferences. In our study we approached this issue by asking directly and individually for farmers' reasons to engage in the different milk-marketing channels. However, it is impossible to guarantee that different personal interpretations of the wording of our questions did not emerge.

The main shortcomings in the application of the semi-structured interview method included the following: First, aspects of the information collected may be inaccurate due to intentional (ulterior interests, sensitive topics) or unintentional (knowledge, recall capacity) alterations by the respondents or due to variations arising from different interviewers' style to follow the semi-structured guideline. Second, as interviews progressed, a more complete picture about the milk-marketing channel in the area emerged which improved interviewers' capacity to come up with follow-up questions. These issues affected the level of detail in the responses of different interviews, complicating the

comparison between channels. As much as possible, we strived to fill the gaps and triangulate the data with information collected from alternative methods and sources. As time allowed for only one interview to be conducted in each commercialization channel, the reliability and validity of the information obtained had to be assumed.

Focus group

During the Focus Group with the village elders only limited new information was revealed. As this method was conducted towards the end of the field study, most of the information was already mentioned during other methods, such as the questionnaire or the structured interviews with the farmers. Only limited information was discussed about the different market players and their current and historic role, which might be attributed to two possible causes. First, the participants did not understand what we were aiming at and/or the method facilitators were unable to communicate the questions in an adequate manner. Second, the participating individuals did not feel any major consequences of the liberalization reforms and do not feel the changing role of the major market players, such as the New KCC. This is further supported by the fact that the farmers in this region do not interact directly with the New KCC but rather through middlemen, such as the Gura SHG.

Additionally, instead of having a free discussion between participants, a rather structured interview with multiple members was conducted. Organizational issues were encountered, such as coordinating who leads the discussion and who translates, and the theoretic methodology of a focus group was misunderstood.

Participant observation

Time restrictions gave little opportunities for a well stratified sampling. Rather than choosing farmers from different marketing channels, age and gender, any dairy farmer who was interested was included. Further, observers were always two or more with the same farmers, creating a more unnatural environment and possibly affecting the behavior of the farmer. Since each observation was done by different students, personal interests and observation skills may affect the data retrieved in terms of quantity and quality. And since time restricted observations to one observation per farm, observed activities may not be fully representative for each day's activities. Observations at milk collections points were problematic to organize and therefore not consistently covered. Hence, information about milk collection may not be fully representative of reality. A single observation does not allow for general conclusions regarding for example buyers' absence of quality testing.

Life stories

In practice, the life story became an unstructured interview with an experienced female dairy farmer, and since students were inexperienced with the method, it was not done accordingly. This affected the results since questions might not have been asked or discussed in a correct way, rather turning the conversation into an interview. In addition, with only one participant data became less diverse, limited to one perspective. However, this situation allowed for more in depth discussions focused on dairy marketing.

Working with interpreters

When needed, two local interpreters were used for application of methods. In addition to translating interviews, they became informants in an ethnographic sense (Burja, 2006), as they explained local behaviors and phenomenon unknown to the students and navigated in the area to find respondents. However, students' dependence on interpreters may have generated a loss of information and attitudes when Kikuyu (local language) was translated into English and vice versa. There were also the cases when interpreters "interpreted" too much so that the answers reflected the interpreter's view rather than the respondent's (Burja, 2006). Finally, interpretation became tricky during the focus group with elders since frequent translation risked to disturb the debate among participants.

CONCLUSION

This study sought to examine the incentives influencing small-scale farmers' decision-making process to engage in formal and/or informal raw milk marketing systems in Gura sub-location. Farmers' marketing choices in formal market channels are affected by monetary factors such as price, accessibility to products and services offered on credit, and non-monetary factors such as reliability of buyers' payments and recommendations from friends. In informal channels, non-monetary factors including trust in buyers, social relationships, collection time in relation to those times offered by formal buyers' emerged as the most important, while price was the main monetary factor influencing farmers marketing strategy. This analysis suggests that government institutions such as the KDB need to take into account these factors in order provide the right incentives for farmers to formalize the marketing of raw milk. For example, KDB could encourage convenient collection schedules and pick up schemes.

Additionally, a number of factors inhibiting farmers to entry formal market channels have been identified. Incomplete market information and access to cooling facilities were considered among these entry barriers. There is a lack of information of different marketing channels and the services offered, which implies that farmers marketing opportunities could improve with increased information. In addition, farmers tend not to realize the full potentials of their dairy production as a business, which affects their choice of market, potentially in favor of informal market channels. Further, lack of access to cooling facilities constitutes an inhibiting factor for farmers, since this might hinder them from storing and selling evening milk to formal buyers in the morning. In relation to this, the absence of collection from formal milk buyers' during evenings might also influence farmers to sell to neighbors and friends or to consume the milk within the household. Entry inhibiting factors were not identified for farmers in informal market channels.

Implications and recommendations

From the results above, several important policy implications can be derived. Local and national government officials need to take into account the importance of and preference for raw milk within the Kenyan culture and the dependence of the rural population on its supply. In particular, individuals living in the rural area are dependent on the supply of raw milk by their neighbors or their own production, thereby making a formalization of this channel difficult. Hence, government officials need to establish alternative and affordable marketing outlets for farmers, in which they can purchase safer pasteurized milk.

As results illustrated, farmers have imperfect knowledge about the different marketing channels which greatly influences their decision-making process. Thus, farmers are advised to organize themselves in order to diffuse information about the different marketing channels and the different products and services offered. Moreover, a farmers' discussion forum enables them to examine different production processes, such as feeding and milk handling, so that they are able to identify the best practices and learn from each other. Farmers could additionally use these forums to discuss and possibly advance in processing their milk into yoghurt or other products, since many farmers are willing to add value to their milk but lack the financial capital and the technology to do so. Given the peri-urban location of Gura, farmers could realize the potential of working together and take advantage of the possible market outlets. Organizing farmers and their interest should result in their empowerment and, ideally, increase margins for their milk.

ACKNOWLEDGEMENTS

The field-based part of the course was a collaboration between the Wangari Maathai Institute for Peace and Environmental Studies at University of Nairobi, Roskilde University and University of Copenhagen. The inputs and efforts of Prof. S. G. Kiama, Prof. R. G. Wahome, Dr. Thenya Thuita, Dr. Cecilia Onyango and Dr. Catherine Kunyanga from Wangari Maathai Institute, Christian P. Hansen from University of Copenhagen and Ebbe Prag from Roskilde University are highly appreciated. This fieldwork and design of the project was collaboratively done by the students Daniel Korir, Harriet Oboge and Brenda Camara from Wangari Maathai Institute and Caroline Hambloch, Karolin Andersson, Denisse McLean and Fabien Eric Florent Jean-Louis from University of Copenhagen. The community of Karima hosted the students and freely contributed to the information in this report through several interviews and informal communications. Their contribution is acknowledged and much appreciated. We are grateful to Chief Stephen Githaiga Mukiri and the community leaders in Karima for all the logistical support in the implementation of the training.

REFERENCES

II. Overview of Focus Group Methodology. (2012). *Monographs of the Society for Research in Child Development,* 77(3), 26-22. doi:10.1111/j.1540-5834.2012.00678.x

Babbie, E. (2010). The Basics of Social Research. 5. Ed. Wadsworth Publishing.

Bowerman, B. L., O'Connell, R. T., & Murphree, E.S. (2009). *Business Statistics in Practice*. 5. Ed. New York: McGraw-Hill.

Burja, J. (2006). Lost in translation? The use of interpreters in fieldwork. In: Desai, V., Potter, R. (Eds.). *Doing development research*. SAGE Publications, pp. 172-177.

Bwongya, A. (1997) <u>Country Pasture/Forage Resource Profiles</u> - Kenya. Rome, Food and Agriculture Organization of the United Nations. Available online at: http://www.fao.org/ag/AGP/AGPC/doc/Counprof/kenya/Kenya.htm#4.

Casley, D.J. and Kumar, K. (1988). *The collection, amalysis and use of monitoring and evaluation data*. World Bank, the John Hopkings University Press, Baltimore, pp. 174.

Dewalt, K., M., Dewalt, B., R. (1998). Participant Observation. In: Russell Bernard. H. (Ed.). *Handbook of Methods in Cultural Anthropology*. AltaMira Press: Walnut Creek. pp. 259-270.

Eswaran, M. and A. Kotwal (1990). *Implications of Credit Constraints for Risk Behaviour in Less Developed Economies*. Oxford Economic Papers, 42(2): 473-482.

FAO. (1996). *Women and sustainable food security*. Rome, Food and Agriculture Organization of the United Nations. Available online at: http://www.fao.org/sd/fsdirect/fbdirect/fsp001.htm, [2014-03-26].

FAO. (2011). The State of Food and Agriculture: Women in Agriculture - Closing the Gender Gap for Development. Rome, Food and Agriculture Organization of the United Nations.

FAO. (2012). Agricultural cooperatives: paving the way for food security and rural development - Leaflet. Rome, Food and Agriculture Organization of the United Nations. Available online at: http://www.fao.org/docrep/016/ap088e/ap088e00.pdf

FAO (2012). Food and agricultural commodities production by country. *FAOSTAT*. Rome, Food and Agriculture Organization of the United Nations. Available online at: http://faostat.fao.org/site/339/default.aspx

Kaitibie S, Omore A, Rich K, Salasya B, Hooton N, Mwero D and Kristjanson P. (2009). *Influence pathways and economic impacts of policy change in the Kenyan dairy sector*. Research Report 15. ILRI (International Livestock Research Institute), Nairobi, Kenya. 58 pp.

Kitzinger, J., Barbour, R. (1999). *Developing Focus Group Research: Politics, Theory and Practice.* SAGE Publications (CA).

Mbugua, J.N., Njonge, F. K., Muchemi, K., Waiyaki, N., Ngaruyia, P. M. (2012). Strategic Value Chain Study of the Small Holder Dairy Sector in Central Kenya. KUAT/CAIS/KIPPRA.

Mikkelsen, B. (2005). *Methods for Development Work and Research. A New Guide for Practitioners*. SAGE publications, India. 2 Ed. pp. 87-121.

Muriuki H.G. Food and Agriculture Organization of the United Nations, 2011. *Dairy Development in Kenya*. Dairy Reports.

Mwangi, R.W. (2013). Factors influencing dairy cooperative societies performance in Mathira and Kieni constituencies, Nyeri county, Kenya. Research project report. University of Nairobi.

Ojermark, A. (2007). *Presenting Life Histories: A literature review and annotated bibliography.* Working paper 101, Chronic Poverty Research Centre.

Omore A, Muriuki HGM, Kenyanjui M, Owango M and Staal S. (1999). *The Kenyan dairy subsector: A rapid appraisal*. SDP research and development report. SDP (Smallholder Dairy Project), Nairobi, Kenya. Available online at http://www.smallholderdairy.org.

O'Sullivan, M., Rao, A., Banerjee, R., Gulati, K., Vinez, M. (2014). *Levelling the field: Improving Opportunities for Women Farmers in Africa.* Washington DC; World Bank Group.

Owango, M., Lukuyu, B., Staal, S.J., Kenyanjui, M., Njubi, D., Thorpe, W. (1998). *Dairy co-operatives and policy reform in Kenya: effects of livestock service and milk market liberalisation*. Food policy vol.23 issue 2 pp.173-185

Staal, S.J., Delgado, C., Nicholson, C. (1997). *Smallholder dairying under transactions costs in East Africa*. World Development vol.25 issue 5 pp.779-794

Staal, S.J., Shapiro, B. (1994). *The effects of recent price liberalization on kenyan periurban dairy - a case study using the policy analysis matrix approach.* Food policy vol.19 issue 6 pp.533-549

Woolridge, J. (2009). Introductory Econometrics, a Modern Approach. 4. Ed. Ohio: Thomson South-Western.

APPENDICES

Method	Number	Respondents
Transect walk	1	Guided by village elder Dixon Kariuki
Questionnaire	35	Small scale dairy farmers
GPS utilization	69	-
Structured interview	12	Small scale dairy farmers
Participant observation	3	Small scale dairy farmers
Participant observation	3	Milk collection points
Focus group	1	Elder dairy farmers
Life story	1	Female dairy farmers
	3	General informants: -Kenya Dairy Board, KDB representative -Sub-chief of Gura sub-location - Andrew Gachagua -Director of the cattle dip in Giathenge
Semi-structured interview	7	Marketing channel representatives: -Gura Dairy Self Help Group -New Mumwe Dairy Agribusiness Ltd -Othaya Dairy Cooperative -Mukurweini Wakulima Dairy Ltd -Brookside Ltd -Demka -Anonymous broker
	3	Banking institution representatives: -Taifa SACCO -Equity Bank -Wananchi SACCO

Appendix I – Table with an overview of applied methods

Appendix II – Synopsis

Interdisciplinary Land Use and Natural Resource Management

SLUSE 2014

February 2014

What are the incentives influencing small-scale farmers' decision-making process to engage in formal or/and informal raw milk marketing systems?

A case study in Giathenge, Kenya.



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Introduction

Agriculture is the main source of income for the rural population in Nyeri South District. A share of 82% of the population derives their livelihoods from agriculture, the main commodities being tea, coffee, dairy as well as horticultural practices. Although emerging agricultural activities such as piggery, rabbits and dairy goat production are increasing, dairy from cattle is the most widespread activity in the area, with almost every household owning at least one dairy cow (Owuor et al., 2009). Additional livelihood strategies prominent in the district are livestock, casual labor and other small businesses. The majority of small farmers are engaged in at least one or several non-related agricultural activities as a means to livelihood security and diversification (Meinecke et al., 2012).

Nyeri county includes 661,156 inhabitants for an area of 3.356 km² and, hence, can be characterized as a relatively high density area. In this part of Kenya, located in the Central Highlands, dairy production is an important sub-sector of agriculture, which accounts for approximately one third of agricultural Gross Domestic Product in the beginning of the 2000s (Staal et al., 2003). The sector is highly dominated by smallholder dairy farmers at the production level, with 80% of produced milk coming from small-scale farmers (Mbugua et al., 2012). Dairy production is applied mostly in zero-grazing practices as a result of the high density and scarcity of land. However free-grazing or a combination of free- and zero-grazing is also found in the area. Large variations are found in the plot size owned by smallholders, from less than 0.2 ha to more than 8.0 ha (Muriuki, 2011).

Agricultural challenges in the district as stated by various farmer groups include, for example, lack of capital, poor service extension from the government, and pests and diseases. There are also indications of farmers experiencing difficulties to acquire loans for starting or expanding agricultural enterprises due to unattainable requirements for collaterals from banks (Owuor et al., 2009). This might create economic entry barriers among some of the most resource poor farmers to engage in commercial agriculture. In relation to this, Mbugua et al. (2012) describes constraints in the smallholder dairy sector of central Kenya, such as inability for farmers to attract premium prices due to low milk volumes, low productivity at the farm level, and weak governance and leadership of stakeholders, which have a negative impact on farmers' incentives to engage in the development of the sector.

Dairy farming in Kenya has been politicized since colonial times when it was governed by the British Empire until 1963. Muriuki (2011) characterizes Kenya's dairy industry at the time as designated to large-scale settler farmers. A crucial event was the establishment of the Kenya Cooperative Creameries (KCC) in 1925, which was founded as a result of an economic depression and in order to promote dairy production, processing and marketing (Atieno, 2008). Colonial settlers pressed for political action in their own favor, with the aim of controlling the dairy sector and eventually creating a monopoly. As a result, large-scale colonial settlers dominated the dairy sector. However, as independence movements approached, more power was given to the indigenous people by making dairy farming accessible to them. The Kenya Dairy Board (KDB), which was established by the state at the end of the 1950s to supervise the dairy sector, extended the power of the KCC as it became the exclusive organization of dairy product marketing (including dairy processing and selling) (Atieno, 2008). Hence, the colonial period laid the foundations of the

politicized environment in the Kenyan economy, in which interests of political and economic elites favored specific interest groups.

When independence from the British Empire was achieved in the beginning of the 1960s, the government pursued two main strings of policy. First, policies were implemented to enhance the participation of native small-scale farmers in the formal market of dairy products by the means of direct intervention and subsidization (e.g. health and breeding services) (Muriuki, 2011). Second, a land transfer program was enacted, which aimed to redistribute the land formerly owned by the colonial settlers to the Kenyan people (Atieno, 2008). As a result, the production of dairy by small-scale farmers grew considerably and became the dominant source of milk production.

The KCC became the dominant market outlet for cooperatives in the dairy industry since it was a guarantor of milk purchase, price stabilizer and supplier of infrastructure (Owango et al., 1998). Even though the KCC was the greatest buyer of dairy products in the formal market, marketing of raw milk in the informal market was tolerated.

By the late 1970s, the politicization of the dairy industry increased further (Muriuki, 2011). Specifically, this took place within the KCC so that its governance converted into a pressing political issue by the 1980s (Atieno, 2008). The KCC was partly unable to release payments to producers in a timely manner and there was a general recognition that prices for the producers were not high enough (Owango et al., 1998). In reaction, smallholder dairy farmer cooperative societies (DFCSs) and farmer self-help groups (SHG) established themselves in order to retail the milk to the KCC (Owango et al., 1998).

In response to the critical situation of the KCC, the government introduced reforms by the end of the 1980s in order to reduce the KCC's influence in specific sectors, such in breeding and health services (Atieno, 2008). In 1992, the government introduced the liberalization of the marketing of milk by decontrolling milk prices and by dissolving the monopoly of the KCC in urban areas. The government's intent was to open up the sector to private producers and processors in order to increase competition between market players, which ideally would result in the growth of producer prices, enhanced access to milk by consumers and an overall efficiency gain in the sector (Owango et al., 1998).

Specifically, the post-liberalization period in the dairy sector was characterized by rapid growth in dairy milk production, for instance, whole fresh cow milk production reached a maximum at 3.7 billion tons in 2006 at the national level (FAOSTAT, 2013). According to Muriuki (2011) it was "due to intense competition among major milk processors as the demand for exports suddenly rose". The displacement of approximately 600,000 people, as a consequence to protests and ethnic violence following the 2007 election, might have had serious consequences on the milk production sector (only 3.2 billion tons produced in 2007 and 2008). However, milk production is increasing again with 3.73 billion tons generated in 2012 (FAOSTAT, 2013).

As a result of dissolving the monopoly of the KCC, the number of market players in the dairy sector in the formal as well as informal market increased. In the formal market, the KCC was reestablished by the government even though the KCC was plagued by mismanagement and corruption in the past (Atieno, 2008). The now-called New KCC has been generally seen to have had a substantial effect on the growth of milk processing without crowding out private market participants. Yet here have been concerns by private processors that the new KCC is favored by the Kenyan government in terms of monetary support. For instance, the Othaya Dairy Cooperative Society (ODCS) strongly discourages any direct trade to the new KCC or brokers due to KCC's deplorable history in the 1990s (Blalock and Promisloff, 2011). Nowadays about 30 licensed milk processors are listed, among those New KCC, Brookside, Spin Knit and Githunguri, who processed more than 80 % of the milk marketed in the formal market channel in 2008 (Muriuki, 2011). Farmers' organizations constitute an alternative model in the formal market (e.g. DFCSs and SHG). For instance, the ODCS buys milk from local farmers and resells it further to the new KCC. Afterwards the margin is used to run the cooperative and to provide farmers' input. Owing to consumer demand, most of the marketed milk is raw, resulting in a reduced role of processors in the formal market where less than 20% of marketed milk is being processed.

In comparison, liberalization, as mentioned before, led to a growth of the informal market, in which milk brokers and milk vendors are important players and the main competitors to the cooperatives, without including the direct milk sales to consumers or milk bars by small-scale farmers. Mbugua et al. (2012) describe this informal marketing sector as being integrated by unlicensed hawkers, brokers, milk kiosks, milk bars and dairy farmers who deliver raw milk to the final consumers. These traders emerged and consolidated during the last two decades in response to the liberalization of the national dairy sector. The informal sector currently absorbs close to 60% of the marketed milk volume.

Owango et al. (1998) conclude that the predominant transformation after the reforms in the dairy sector was a considerable weakening of the KCC as a milk marketer in favor of informal dairy channels that market unprocessed milk. Hence, although liberalization policies aimed to increase private dairy market participation, it led to a considerable enlargement of the unregulated informal raw milk industry. Additionally, real prices paid to producers increased significantly and the participation of DFCs expanded substantially. Owango et al. (1998), however, link this to the unintended development of the informal market of unprocessed milk, partly due to the favoring of raw milk due to its lower cost and preferred taste.

Currently, a number of issues arise from the operation of these two different commercialization channels (Mbugua et al., 2012). On the one hand, the capacity of the formal dairy processing sector is underutilized. Only 30% of the 3-million liter processing capacity at the national level is satisfied, given the low volumes of raw milk delivered to processors through formal commercialization. On the other hand, quality and efficiency problems emerge from the lack of sanitary oversight and the deficient management of the cold chain along the informal marketing channel. Wastages at the farm level can reach more than 6% of total production (Muriuki, 2011). Losses often result of spillage, lack of market, difficulty to reach the market (distance, transport infrastructure) and rejection at market due to too high production (especially in the wet season) or to hygiene concerns. These problems lead to losses of up to 40% of the marketed milk volumes and to inconsistent quality in the dairy products reaching the final consumers. In this context, there is a need for a clear identification of strategies to make better use of the marketable milk produced by smallholders, as well as of a mobilization of smallholders into efficient marketing chains.

Research problem

The high share of milk commercialized through informal channels poses a challenge for quality control and the minimization of losses in the Kenyan dairy sector (Mwangi, 2013). As a result, government authorities are working towards formalization through training and registration of the informal milk brokers and vendors, as part of the National Livestock Development Policy and Vision 2030 (Mbugua et al., 2012). Furthermore, there is a need to regularly compile economic information about different dairy technologies to ensure that relevant indicators are monitored and are available to inform decision making of small-scale farms (Mbugua et al., 2012).

Thus, research, which sheds light on the incentives/factors shaping small-scale farmers' decision to engage in formal or informal marketing channels, could be useful to assist policy makers. Thereby, more informed decisions can be taken and strategies for market formalization can be designed. Consequently, both the livelihoods of small-scale dairy farmers and the national dairy sector could be strengthened. Likewise, a reflection on the cost and benefits incurred could help small-scale farmers select the most efficient marketing strategies in terms of high, fast and secure returns, reduced milk losses and sustainable practices, and increasing farmers' motivation to get more engaged in dairy production.

The objective of this comparative study is to analyze small-scale farmers' decision-making process to engage in formal and informal raw milk marketing systems, with Giathenge village as a case study, and to understand the constraints and advantages of these systems. We aim to achieve this by identifying the differences in the main costs and benefits between small-scale dairy farmers engaged in each of these marketing channels.

The study seeks to address the following research question:

What are the incentives influencing small-scale farmers' decision-making process to engage in formal or/and informal raw milk marketing systems in the case of Giathenge village?

Sub-questions:

- 1. How are the formal and informal raw milk markets/market channels characterized in Giathenge village? In terms of number of existing marketing channels, definition/conceptualization of "formal" and "informal", number and characteristics of producers engaged, milk volumes absorbed, demand stability (seasonal variations), quality issues of milk between farmers and buyers (associations, hawkers etc.), prices paid to farmers, entry requirements, regulations, institutions, networks, current practices of value-addition etc.
- 2. What are the most important monetary and non-monetary cost and benefits for smallscale farmers to engage in formal or/and informal raw milk marketing systems?
 - a. What are the most important monetary cost and benefits parameters?
 - b. What are the most important non-monetary cost and benefits parameters?
 - c. From these costs and benefits, which are the main entry barriers for small-scale dairy farmers to gain formal and/or informal market access?

- i. What is the role of associations (cooperatives, self-help groups, etc.) facilitating market access to small-scale dairy farmers?
- ii. What is the role of small-scale farmers' spatial distribution facilitating market access to dairy farmers?
- iii. What is the role of credit markets facilitating market access to small-scale dairy farmers?
- iv. What is the role of gender facilitating market access to small-scale dairy farmers?
- v. What is the role of value addition facilitating market access to small-scale dairy farmers?

Methods and Data collection

The data collection takes place along the 11 days of fieldwork. A large range of methods will be applied for the collection in the aim to answer to the research question. Semi-structured interviews with the different players in the dairy milk market (associations, farmers, cooperatives, hawkers and brokers) provide data to characterize the informal and formal market channel in Giathenge, and help to identify the most important monetary and non-monetary costs and benefits for farmers to engage in these different channels in triangulation with the PRA preference ranking method. In parallel, participant observations with farmers engaged in the different branches of both formal and informal dairy market and questionnaires addressed to a representative sample of farmers could reveal several of the entry barriers facing farmers and provide statistical data (geography, productivity, socio-economy). Those information triangulated with the transect walk led with the village head and outputs from the focus groups will then provide an overview of what are the incentives influencing farmers in their decision making to opt for informal or/and informal market.

Sampling strategy

The sampling strategy employed for the questionnaires will be of random sampling, i.e. each individual will be chosen with equal chance, in order to keep the bias of the results low (Woolridge, 2009). Practically, we aim to get a sample size of a minimum of 30 individuals of the whole population (village) and, if possible, more. Assuming that the village head has a list of the individuals living in the village, we would choose every 5th or 6th person on the list to hand him/her out a questionnaire. In the case of non-availability of that person, we would choose one of the neighbors instead. Ideally the sample would be representative for gender, age, participation in the formal/informal market etc.

Annex I. Methodological Framework

Objective	Sub-questions	Sub-subquestions	Data required	Methods	Equipment
To analyze	1. How are the		-Census data	-Secondary literature review	
small scale	formal and		-Cadastral information		
farmers'	informal raw				
decision-	milk market		-No of marketing channels	-Semi-structured and structured interview to Village	Recorder
making	channels		-Identification of key informants from each channel	head and/or Municipal authority	
process to	characterized		-Impressions on governance issues between and within		
engage in	in Giathenge		commercialization channels		
formal and	village?				
informal raw			-Spatial distribution of socioeconomic & gender based	-PRA – transect walk with Village head and/or	GPS, Recorder
milk marketing			groups in village	Municipal authority	Illustration
systems, with					material
Giathenge					
village as a			-Legal framework applicable at the local level	-Secondary literature review	
case study,				-Semi-structured and structured interview to KDB	
and to				representatives	
understand					
the constraints			-Historical evolution of dairy value chain	-Small focus group with elder dairy farmers	Recorder
and	2. What are	a. What are the	-Formal requirements to participate in associations or	-Semi-structured and structured interview to key	Recorder
advantages of	the most	most important	marketing channels	representatives of the marketing channels	
these systems.	important	monetary cost and	-Prices offered for dairy products		
	monetary and	benefits	-Products and services offered in marketing channels		
Research	non-monetary	parameters?			
question	cost and		-Farmers' choice of marketing channel	-Farmers' questionnaire	Recorder
	benefits for		-Farmers' monetary costs for commercialization	-Participant observation in farmers' dairy activities	
What are the	small-scale		-Prices received for dairy products	-Semi-structured interview with farmers	
incentives	farmers to		-Farmers' socioeconomic characteristics		
influencing	engage in				
small-scale	formal or/and		-Farmers' evaluation of the most important monetary	-Structured interview with farmers	Recorder
farmers'	informal raw		costs and benefits		Illustration
decision-	milk marketing				material
making	systems?	b. What are the	-Non-monetary requirements to participate in	-Semi-structured and structured interview to key	Recorder
process to		most important	associations or marketing channels	representatives of the marketing channels	
engage in		non-monetary cost	-Role of consumers' preference shaping market demand		
formal or/and		and benefits			
informal raw		parameters?	-Farmers' choice of marketing channel	-Farmers' questionnaire	Recorder
milk marketing			-Farmers' non-monetary costs for commercialization	-Participant observation in farmers' dairy activities	
systems in the			(labor, social relations with buyers, etc.)	-Semi-structured interview with farmers	
case of			-Non-monetary benefits received in marketing channels		
Giathenge			-Farmers' socioeconomic characteristics		
village?					
			-Farmers' evaluation of the most important non-	-Structured interview with farmers	Recorder
			monetary costs and benefits		Illustration

				material
	c. From these costs	-Farmers' evaluation of the main entry barriers	-Participant observation in farmers' dairy activities	Recorder
	and benefits, which		-Semi-structured interview with farmers	Illustration
	are the main entry		-Structured interview with farmers	material
	barriers for small-			
	scale dairy farmers			
	to gain formal			
	and/or informal			
	market access?			
	i What is the role of	For each marketing channel:	-Semi-structured and structured interview to key	Recorder
	according the role of	No of farmors involved	representatives of the marketing channels	Recorder
	(cooperatives celf	Milk volumes traded	representatives of the marketing channels	
	(cooperatives, seij-	Formers' sharestaristics		
	neip groups, etc.)	-Farmers characteristics		
	facilitating market	-Products and services offered in marketing channels		
	access to small-	-Issues arising with milk quality		
	scale dairy farmers?		- · · ·	- ·
		-Costs and benefits incurred/received from associations	-Farmers' questionnaire	Recorder
			-Participant observation in farmers' dairy activities	
			-Semi-structured interview with farmers	
	ii. What is the role	For each marketing channel:	-Mapping	GPS, Recorder
	of farmers' spatial	-Spatial location of farmers involved	-PRA – transect walk with Village head and/or	Illustration
	distribution	-Infrastructure access	municipality authority	material
	facilitating market	-Spatial location of marketing channel centers		
	access to small-			
	scale dairy farmers?	-Farmers' view on spatial accessibility role	-Semi-structured interview with farmers	Recorder
	iii. What is the role	For farmers' in each marketing channel:	-Farmers' questionnaire	
	of credit markets	-Credit sources		
	facilitating market	-Credit terms		
	access to small-			
	scale dairy farmers?	-Farmers' view on credit role	-Semi-structured interview with farmers	Recorder
	,,,			
	iv. What is the role	-Farmers' view on gender specific roles, norms, women's	-Life stories with women dairy farmers	Recorder
	of gender	rights	,	Illustration
	facilitatina market	5	For women dairy farmers:	material
	access to small-		-Farmers' questionnaire	
	scale dairy farmers?		-Particinant observation in dairy activities	
	scale daily jurners.		-Semi-structured interview	Recorder
	v What is the role	-Value adding practices in marketing channel	-Semi-structured and structured interview to key	Recorder
	of value addition	-Reasons for value addition	representatives of the marketing channels	necoraci
	of value addition		representatives of the marketing channels	
		Value adding practices for farmers		Recorder
	uccess to small-	-value adding practices for farmers	France and an estimate in a	Recorder
	scale aairy farmers?	-keasons for value addition	-Farmers questionnaire	
			-Participant observation in farmers' dairy activities	
			 Semi-structured interview with farmers 	

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Annex II. Project Timeline

		Week 6		Week	7		Week 8	3	Week 9	Week 10		Week 11		Week 12	Wee	ek 13
Activity	М	TWTFSS	5 M	тwт	F	S S	MTWTF	s s	MTWTFSS	MTWTFS	5 S	MTWTF	S S	MTWTFS	sмтw	TFSS
Literature search + review of secondary data											_					
Preparation of interview guides & questionnaires																
Synopsis process																
Introduction/informal observation																
SSI + transect walk (PRA) (village head)																
Church																
Questionnaire (dairy farmers)																
Environment day																
Participant observation																
SSI (dairy farmers)																
SSI (New KCC, ODCS, KDB, hawkers, brokers, SHG)												_				
Preference ranking (PRA) (dairy farmers)																
Focus group (women + elderly)																
Mapping day (GPS)																
"Day off"																
Feedback											_					
Report compilation			1													
Data analysis																

In Giathenge, Kenya

SSI = semistructured interview

ODC = Othaya Dairy Cooperative

KDB = Kenya Dairy board (Nyeri)

New KCC = New Kenya

Cooperative Creameries

SHG = Farmers' self-help group

Annex III. Potential hypotheses

Potential monetary costs:

- Formal market:
 - Membership fees
 - Costs related to quality control
 - Transportation costs
 - Interests fees if any loan had to be taken
 - Investment in technology for processing
 - Costs for packaging and processing
 - Informal market
 - Transportation costs
 - Interests fees if any loan had to be taken
 - o Investment in technology for processing
 - Costs for packaging and processing

Potential non-monetary costs:

- Time/labor used to transport the milk to the point of sell
- Social relations/networks
- Necessity to be a member of an association (e.g. bulking requirements, quality requirements)

Potential monetary benefits:

- Price/profit received from selling raw and processed milk
- Other products and services (e.g. artificial insemination) offered by a buyer or associations (e.g. discounts on services)

Potential non-monetary benefits:

- 1. Access to other products and services offered by a buyer or associations
- 2. Women/small producers are able to participate to a larger extent
- 3. Security/Certainty: Secure and stable income, immediate payment
- 4. Shorter distances to points of sell/lower transportation costs
- 5. Trust in the buyer (familiarity, long term commercial relation, status of the buyer)
- 6. Personal status for selling in that channel (for example, as a member of an association)
- 7. Improved quality of milk (formal market)
- 8. Smallholders' involvement in decision making along the milk value chain
- 9. Capacity to absorb a large volume of milk during the wet season

Potential entry barriers:

- Monetary (e.g. membership fee) and non-monetary (e.g. social relations) requirements to become a member of an association
- Spatial location factors (may increase transportation costs or grant access to a channel)
- Costs to comply with quality control/standards
- Costs of value-added processing: technology/training
- Access to credit sources (formal and informal)
- Gender in relation to asset ownership and factor markets (which could facilitate financing marketing costs and/or influence farmers membership to an association)

References

Atieno, R. & Kanyinga, K. (2008). The Revitalisation of Kenya Cooperative Creameries: The Politics of Policy Reforms in the Dairy Sector in Kenya. Future Agricultures.

Blalock A. and Promisloff B. (2011). *Agricultural Production in Othaya, Kenya*. FAOSTAT Food and Agriculture Organization of the United Nations Database, 2013. Retrieved from: http://faostat3.fao.org/faostat-gateway/go/to/home/E

Mbugua, J.N., Njonge, F. K., Muchemi, K., Waiyaki, N., Ngaruyia, P. M. (2012). *Strategic Value Chain Study of the Small Holder Dairy Sector in Central Kenya*. KUAT/CAIS/KIPPRA.

Meinecke, S. M, Pandey, A., Thant, A., M., Madalinska, A., Sorensen, C., Wilson, M. (2012). *Crop production and livelihood strategies in Soli Village 3, Nyeri District, Kenya*. Abstract from Tropentag 2012, Göttingen, Germany.

Muriuki H.G. Food and Agriculture Organization of the United Nations, 2011. *Dairy Development in Kenya*. Dairy Reports

Mwangi, R. W. (2013). Factors Influencing Dairy Cooperative Societies Performance in Mathira and Kiene Constituencies, Nyeri County, Kenya. Master's thesis, University of Nairobi, Kenya.

Owango, M., Lukuyu, B., Staal, S. J., Kenyanjui, M., Njubi, D., & Thorpe, W. (1998). Dairy co-operatives and policy reform in Kenya: effects of livestock service and milk market liberalisation. Food Policy, 23(2), 173-185. doi: http://dx.doi.org/10.1016/S0306-9192(98)00027-X

Owuor, B., Wambui, B., Argwings-Kodhek, G., Poulton, C. (2009). *The role and performance of Ministry of Agriculture in Nyeri South District*. Future Agricultures Research Paper 018.

Staal, S.J., Waithaka, M., Njoroge, L., Mwangi, D.M., Njubi, D., and Wokabi, A. (2003). *Costs of milk production in Kenya: Estimates from Kiambu, Nakuru and Nyandarua districts*. SDP Research and Development Report No.1 Smallholder Dairy (R&D) Project.

Woolridge, J. (2009). Introductory Econometrics, a Modern Approach. 4. Ed. Ohio: Thomson South-Western.

Appendix III - Interview guides

1. Transect Walk in Gura sub-location

- Spatial guiding questions to be answered
- Where are the cow-owners?
- Where are the commercial dairy farmers?
- Where are the female dairy farmers?
- Are male and female dairy farmers segregated or mixed?
- Are dairy farmers engaged in different market channels segregated or mixed?
- Where are the different cooperatives or self-help groups headquarters/located?
- Where are the centers of distribution?
- Where are the different markets?
- Where are the different facilities (cooling plants, storage building,...) used by the dairy farmers?
- Where/which are the wealthiest and poorest dairy farmers? Is there any segregation?
- Which roads/routes are hardly practicable in the wet season?
 - Are there any differences between transportation routes taken in the wet and dry season?
- What problems or constraints related to dairy farmers can be met in the different areas of the village?
- What possibilities or advantages can be met by dairy farmers in the different areas of the village?

How could a policy change (regulation/formalization of the informal market) affect the characteristics of different areas in relation to the dairy market?

2. Questionnaire with small scale dairy farmers in Gura sub-location

- Gender. 1 Male Female 2. How many cows does your household own? **O** (end of questionnaire) **1 2 3** □ >3 3. What is your age? _____years How much land does this household own? (Excluding rented plots) 4. units: 5. How much land does this household rent? ____ units: ___ 6. How many people currently depend on the income of this family? **1** 2 3 **4** □ >5 7. From the people above, how many of them are children 12 years old or under? 0 **1 □** 2 **3** □ >3 8.
 - . Name in order of importance the 3 activities that contribute the most to the income of this family.

Activity 1 ______ Activity 2 _____

	Activity 2
٩	ACLIVILY 3
9.	Activity 1
	Activity 2
	Activity 3
10	How much raw milk would this household have to huv every day for this house if you did not have any cow?
10.	units.
11	Do you sell any milk?
	\Box Yes (ap to 12)
	Why do you not sell any milk?
12.	During the dry season, how much raw milk would this household produce on a typical day for sale?
	units:
13.	During the wet season, how much raw milk would this household produce on a typical day for sale?
	units: (if answer is 0 in Q11 and Q12, end of questionnaire)
14.	What price did this household receive for the raw milk on a typical day during the past wet season?
	Ksh per (unit)
15.	What price does this household expect to receive for the raw milk on a typical day during the coming dry season?
	Ksh per (unit)
16.	Who does this household currently sell the raw milk to? Please list from largest volume to smallest.
	Channel 1:
	Channel 2:
	Channel 3:
	Channel 4:
17.	When did this household start to sell the raw milk to the main buyer?
	units:ago
10	
18.	Why does this household sell the raw milk to the main buyer?
<u> </u>	Why does this household sell the raw milk to the main buyer?
18. 19.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm?
18. 19.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Image: Yes (go to 20a)
18. 19.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b)
18. 19. 20.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Ves (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)?
18. 19. 20.	 Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)?
18. 19. 20.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)? units:
18. 19. 20. 21.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Ves (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)? units: How long does it take for you to reach this buyer?
18. 19. 20. 21.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)? Locate
18. 19. 20. 21. 22.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? I Yes (go to 20a) I No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)? units: How long does it take for you to reach this buyer? units: Does this household process the raw milk further with any of the following techniques? <u>-Verify</u>
18. 19. 20. 21. 22.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Ves (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)? Units:
18. 19. 20. 21. 22.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? I Yes (go to 20a) I No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)? units: How long does it take for you to reach this buyer? units: Does this household process the raw milk further with any of the following techniques? <u>-Verify</u> I Boiling/pasteurizing I Yogurt
18.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)? units: units: How long does it take for you to reach this buyer?units: Does this household process the raw milk further with any of the following techniques? - <u>Verify</u> Boiling/pasteurizing Yogurt Ghee
18.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)?
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18.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far does this buyer located (go to 21)?
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18.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)?
18.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Yes (go to 20a) No (go to 20b) (20a) How far does this buyer come from (go to 22)? (20b) How far away is this buyer located (go to 21)?
18.	Why does this household sell the raw milk to the main buyer? Does the main buyer pick the raw milk up at your house/farm? Preduct 3:

b. If yes, why did you/he/she decide to become a member?

c. If no, why did you/he/she decide not to become a member? 25. Is anybody in the household a member of a dairy self-help group? □ Yes (specify name) _ No a. If yes, how long have you/he/she been a member? b. If yes, why did you/he/she decide to become a member? c. If no, why did you/he/she decide not to become a member? 26. Does any member of the household receive any credit for any of the economic activities (formal bank, "informal" source)? Yes (go to 26) Bank Cooperative Self-help group Microfinance inst. Relative • Others (specify): □ No (end of questionnaire) 27. What types of guarantees does this credit source typically require in order to give a credit? Land title Cattle □ Harvest/produce House □ Savings/money

Membership
 Others (specify):

3. Focus Group with Experienced Dairy Farmers

Experience

How long have each of you been dairy farmers?

- Who did you use to sell the milk when you started selling?
- How has this changed along your years as dairy farmers?

Market liberalization

• What changes do you think dairy farmers from the village have experienced after the liberalization of the national dairy sector in 1992?

• Do you have the impression there has been a significant change in who are the buyers of raw milk in the village since the sector liberalization? How and why?

• Which new buyers have entered the raw milk market after the sector liberalization?

• Do you have the impression that some buyers became more important than others since the sector liberalization? who?

- Why do you think some farmers changed, who they sell their milk to, and why some did not?
- In your opinion, what is the role/importance of the more recent buyers for the dairy farmers of the village?
- In your opinion, what is the role/importance of the older buyers for the dairy farmers of the village?

ксс

- What was the role/importance of the KCC when it was still a monopoly in the dairy market?
 - a. What is the role/importance of the new KCC?
 - b.

Cooperatives

- When did the dairy cooperatives emerge in the village?
 - a. In your opinion, what is the role/importance of the cooperatives for the dairy farmers of the village?
 - b. Are there any cooperatives that you perceive to be more important than others for dairy farmers in the village? Why?

Self-help groups

- When did the farmers' self-help group emerge in the village?
- a. In your opinion, what is the role/importance of the farmers' self-help group for the dairy farmers of the village?
- b. Are there any farmers' self-help groups that you perceive to be more important than others for dairy farmers in the village? Why?

4. <u>Structured interview with small scale dairy farmers</u>

- 1. Who do you sell most of your milk to? (main channel)
- 2. Are there any monetary costs/expenses you have to pay to sell your milk? (weekly or monthly fees for example)
- 3. On a typical day, between the moment you collect the milk from your cows and the moment you receive the payment for the milk, could you list all the monetary costs/expenses you have to pay? (include concept and quantity)
- 4. Other than paying monetary costs, what else do you have to do to be able to sell your milk in this channel?
 - Do you have to be a member of a group?
 - Do you have to know/be friend of a specific person?
 - Do you have to spend time transporting the milk?
 - Do you have to live in a specific place?
 - Do you have to have access to credit?
 - Do you have to process your milk somehow? *for example*
- 5. What price do you receive for your milk when you sell to this buyer?

_____ units _____

- 6. Are there any other <u>monetary</u> benefits you receive for selling the milk in this channel? Which ones?(*discounts, products, price premiums for example*)
- 7. Are there any other <u>non-monetary</u> benefits you receive for selling the milk in this channel? Which ones?(*services, social relations for example*)
 - Has selling in this commercialization channel helped you in any way other than for selling your milk? If yes, how?
- 8. For the channels he/she does NOT participate in

Preliminary channels>	Othaya Dairy Cooperative	Self-help groups	Other cooperatives	Hawkers/brokers (informal channel)
-Would you like to be able to sell your milk to <i>this channel</i> ?				
-Why? Please expand on your reasons.				
-If tomorrow you would like to sell your milk in this channel, would you be able to?				
-Why? Please expand on your reasons.				

9. If the farmer sells in multiple channels:

Why don't you sell all your milk through one single channel?

5. <u>Semi-structured interviews</u>

Village head/municipal authority

- 1. What are all the different buyers a dairy farmer can sell his/her raw milk in Giathenge?
- 2. Which of these buyers are formally registered?
- 3. Do some buyers give priority certain type of farmers?
- 4. Who would be the most appropriate person to talk to in each of these channels if we want to learn more about them?
- 5. Is there any census data from Giathenge village that we could access?
- 6. Is there any cadastral information from Giathenge village that we could access?

Kenya Dairy Board

- 1. What are the formal requirements to be a milk buyer/seller from small-scale dairy farmers?
- 2. Which players in the dairy market do you perceive as formal and informal?
- 3. What are the roles/importance of the formal and informal dairy market?
- 4. Which of the marketing channels in Giathenge are formally registered?
- 5. How do you enforce your regulations? How are milk standards complied with? What happens if there is non-compliance?
- 6. What is your influence on small-scale dairy farmers?
- 7. What measures do you take to formalize the market?

Marketing channels (GDSHG, Brookside, ODCS, brokers, NMDA, MWD etc.)

Information about members (Section for associations):

- 1. How many members are registered in your association?
- 2. How many of these members are active right now?
 - What are the characteristics of your members?
 - a. Where are they located?
 - b. If you pick up the milk, how much do you have to travel to reach the farmers?
- 4. How many of the members are women?
 - Number/share: _____
 - None, why not?
- 5. What are the requirements for farmers to become members?
- 6. Do farmers have to be a member of the cooperative to deliver milk to you?
 - Yes

3.

- 🛛 No
- 7. How many farmers sell milk to you?
- 8. Are you trying to get more members?
 - □ Yes, why? what measures do you take?
 - □ No, why?
- 9. (Skip if only members can sell in this channel).
 - Are you trying to get more non-member farmers?
 - □ Yes, why? what measures do you take?
 - No, why?
- 10. Do you offer any products and services to your members?
 - Yes, which ones?
 - □ No, why?
- 11. Do the farmers receive a discount (or for free) on the services?
 - Yes
 - 🖬 No

Information about the milk

- 12. What was the average milk price given to the small-scale farmers in the last wet season?
- 13. What was the average milk price given to the small-scale farmers in the last dry season?
- 14. What was the average milk price at which your association sells it further in the last wet season?
- 15. What was the average milk price at which your association sells it further in the last dry season?
- 16. Do you offer price premiums to the farmers?
- on the quality level

		Yes	How much?	_ units	_
		No			
1	on volun	ne level			
		Yes	How much?	_ units	_
		No			
1	any othe	r factors			
		Yes	How much?	_ units	_ Factor
		No			

17. What is the minimum volume of raw milk that you accept per delivery?

18. What is the maximum volume of raw milk that you accept per delivery?

- 19. How much milk do you sell on average per year?
- 20. What are the raw milk quality requirements for the milk that you buy from the farmers?
 - a. Do you make any quality test to the milk you receive?
- 21. How much milk do you reject on average per week?
 - a. Is the rejected milk coming from the same farmers/suppliers?
- 22. What do you do with oversupply of milk?
- 23. What are the dairy products your clients prefer? Why?
- 24. Do you add value to the raw milk? Why (or why not)?
- 25. We have got information on that many farmers might go through the informal market channel instead of through the cooperative, what do you think could be the reasons for this?
- 26. What are the regulatory requirements from the KDB (Kenya Dairy Board) to buy and sell the milk?
- 27. Have you experienced any problems when buying milk from the farmers? What kind?
- 28. Have you experienced any problems when selling milk to your clients? What kind?
- 29. Are there any additional issues within this channel that you want to share with us? (lack of money, lack of managerial training, lack of members...)

30. Spatial location of marketing channel centers? where are located the different market centers (Salavangia, etc.)? Do you have to <u>register</u> your activity in order for your organization to operate?

6. Participant observation

Things to look for

Between the moment the farmer collects the milk from the cows and the moment he/she receives the payment for the milk:

- Who buys the milk from the farmer?
- All the monetary costs/expenses he/she has to pay (concept and quantity)
- Any other monetary costs/expenses to sell the milk in the channel (fees for example)
- Any non monetary requirement to be able to sell the milk in the channel
 - o Membership in a group
 - Knowledge of/friendship with a specific person
 - Time spent (transporting milk, or in any other commercialization activity)

units

- o Farmer/house location
- o Access to credit
- Milk processing (for example)
- Price received for the milk
- Any other monetary benefits received for selling the milk in the channel (discounts, products, price premiums for example)
- Any other non-monetary benefits received for selling the milk in the channel? (services, social relations for example)

7. Life stories with Women Farmer

Experience

- How long have you been dairy farmers?
- How did you start as a dairy farmer? How did you obtain your cow(s)?
- Who did you use to sell the milk when you started selling?
- How has this changed along your years as a dairy farmer?

Market liberalization

- What changes do you think dairy women from the village have experienced after the liberalization of the national dairy sector in 1992?
- Has there been any changes in your possibilities to participate in activities related to dairy farming after passing the new constitution in 2010?

Cooperative

- In your opinion, what is the role/importance of the cooperatives for women dairy farmers of the village?
- a. Are there any cooperatives that you perceive to be more important than others for women? Why?

Self-help group

- In your opinion, what is the role/importance of the farmers' self-help group for the women dairy farmers of the village?
 a. Are there any farmers' self-help groups that you perceive to be more important than others for women? Why?
 Entry barriers to markets
- Have you experienced any difficulty as a dairy farmer for being a women? (access to financial resources, land, products, services, associations, for example)
- Do you feel that you have been treated the same as other men dairy farmers?

Appendix IV – List of variables

SEX	m=1, f=2	
cows	heads of cows own	
AGE	years of age	
LAND	land owned	unit: acres
RENT	land rented	unit:acres
CONSUMP	consumption per household	unit: liters
SELL	Do you sell your milk?	1=yes, 2=no
PRODDRY	Production of milk in the dry season	Unit:liters
PRODWET	Production of milk in wet season	Unit:liters
PRICEWET	Price of milk in wet season	Unit:liters
PRICEDRY	Price of milk in dry season	Unit: liters
CHANNELA	Primary marketing channel	
CHANNELB	Secondary marketing channel	
PICKUP	Is your milk picked up?	1=yes, 2=no
DISTKMPICK	Distance to collection point	Unit:km, one way
DISTTIMEPICK	Distance to collection point	Unit: km, one way
PROCESS	Do you process?	1=yes, 2=no
COOLING	Do you cool your milk?	1=yes, 2=no
СООР	Are you part of a cooperative?	1=yes, 2=no
SHG	Are you part of a self-help group?	1=yes, 2=no
CREDIT	Do you receive any credit?	1=yes, 2=no

	Formal						Informal
Marketing channel	Brookside Ltd	Gura SHG	NMDA	ODCS	Demka	Mukuruweini	Broker
Business type	KDB-registered dairy cooling and processing company	KDB-registered milk collector farmer self-help group	KDB-registered milk collector	KDB-registered dairy cooling and processing cooperative	KDB-registered milk collector	KDB-registered milk collector and public company	Non-registered individual broker
Number of farmers	Not answered	67 (43 active)	30-40	11500 (150 active)	400 (50 from Gura)	4500 (120 from Gura)	35 (25 active)
Female participation	Not answered	65%	70%	30% (previously 50%)	65-70%	Not answered	80%
Farmers' characteristics	Not answered	Small-scale farmers from Gura sublocation	Small-scale farmers	Located in the 15km vicinity of Othaya	Small-scale farmers who prefer early payment at beginning of month and wake up early	Small-scale farmers	Located in the 2km vicinity of Kinaidy
Promotion strategy	Marketing	Word of mouth	Word of mouth and direct promotion	Fundraising to pay debts	Word of mouth	Field days	Word of mouth
Registration requirements	Registration as milk seller. ID and bank account information.	Registration as member. ID and bank account information. 500 ksh membership fee paid in quotes.	Signing up with collector ID and bank account information	Registration as member. ID and bank account information. 500 ksh membership fee paid in quotes. Acquisition of 4 membership shares for 1000 ksh total.	Registration as milk seller. ID and bank account information. Comply with milk quality conditions.	Registration as milk seller. ID and bank account information. Acquisition of membership shares is optional.	Signing up with broker
Collection method	Pick up at collection points in trucks with metallic containers Farmers deliver directly in Othaya	Farmers' deliver directly to SHG member's house and milk is then transported in motorbikes with plastic and metallic containers	Pick up at collection points in trucks with metallic containers	Pick up at collection points or farm gate in trucks with metallic containers	Pick up at collection points in motorbikes with plastic and metallic containers	Pick up at collection points in trucks with metallic containers	At farm gate or farmers' deliver directly to broker's house
Collection time - Gura	Morning, 5-6am Anytime in Othaya	Morning, 5-6:30am	Morning, 7:30- 8:30am	Not collecting for the moment	Morning, 8-9am	Morning, 5-7am Evening 11:45-1pm	Evening, 3pm
Payment method	Once a month through bank account, 15-21 days after end of month. SMS/email notifications of price changes.	Once a month through bank account, after payment from KCC	Once a month through bank account or cash, after payment from KCC	Once a month through bank account or cash	Once a month through bank account or cash, after end of month.	Once a month through bank account	Weekly payment Day to day at broker's discretion

Appendix V – Characterization of the milk marketing channels in Gura sub-location

Formal Informal Marketing channel Brookside Ltd Gura SHG NMDA ODCS Mukuruweini Broker Demka Volume accepted 1 l and up 0.5 I and up 1 l and up 0.5 I and up 0.5 I and up 0.5 I and up 1 l and up Price paid (wet 32-40 ksh/l at Othaya 38 ksh/l 27-28 ksh/l 30-32 ksh/l Price follows 29 ksh/l Not answered 28 ksh/l at collection Brookside pricing 25 ksh/l (from season) questionnaire) Price paid (dry points 38 ksh/l 32-35 ksh/l 34-35 ksh/l 33 ksh/l season) Price premiums None Quantity premiums (5 ksh/l for volumes >1000 l) None None None None if obtained from New KCC are transferred to farmers Other products and Partners who offer Discounted feed Feed supplies. AI and Discounted feed supplies. Free advice upon Discounted feed Cash advance in services feed supplies, AI and AI and veterinary services milk rejection supplies, AI and veterinary services on supplies, feed emergency situation veterinary services on on credit, deducted from veterinary services on credit deducted from machinery, AI, at brokers' discretion credit payslip credit, deducted from payslip veterinary services, Free advice and Free advice and Free advice and training 4 payslip biogas equipment, training 2 times a year times a year with Free advice and training staple food and training (farmers field or upon milk rejection KCC/KDB personnel personal loans on SHG signs as guarantor credit, deducted from day) for loans from formal payslip. Free advice upon milk credit institutions Cooling facilities for rejection afternoon milk at chairmans' discretion Volume received 700-800 l/dav 500 l/day 1500 | per day (from 35000 l/day (from all Not answered 170 l/day 80-100 l/day dry (from all farmers) all farmers) farmers) season 170-200 l/day wet season Density 1.0280 Quality requirements Density, alcohol negative, Density, alcohol Density, alcohol Density, alcohol Density, alcohol Density Alcohol negative, free of visible impurities negative negative, mastitis free negative, good smell negative Butter fat 3.7%, Lactic Acid 0.13-0.14%. Solid non fat <0,85 % Quality testing All milk tested at Milk tested randomly at Milk tested Milk tested at Milk tested randomly Milk tested randomly Milk tested randomly collection plant in randomly at collection point at collection point at collection point 1-2 times per week at collection place. Othava (although no Equipment supplied by collection point collection place testing was observed) KCC Milk rejection Few cases Cases followed by Cases followed by advice Cases followed by Cases followed by Cases followed by advice and training on advice and training and training, recurrent advice and training advice on the spot, cases are expelled under recurrent cases are farm

group consensus

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expelled

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	Formal						Informal
Marketing channel	Brookside Ltd	Gura SHG	NMDA	ODCS	Demka	Mukuruweini	Broker
Issues when buying milk	Farmers delay in delivery due to poor road infrastructure especially during the wet season	Occasional quality issues	None	Occasional quality issues Low milk density during wet season due to water content in fodder Lack of trust in ODCS due to unpaid checks	Occasional quality issues Alteration on payment slip	None	Occasional quality issues
Consumers' preferences	Not answered	Raw milk sold to processors	Raw milk sold to processors	Raw milk sold to processors	Raw milk and growing demand for yogurt	General preference for raw milk in periurban areas	Raw milk
Value addition	None at the cooling plant, but pasteurized, flavored and UTH milk, cream, lala, yogurt processed in Nairobi	None at the moment due to costs, but under consideration	None	None at the moment due to organizational issues, but plant to restart producing cheese and yogurt	Yogurt produced since 2013, 300 l per day	None at the moment due to costs, but under consideration	None
Aware of KDB regulation on raw milk	Not answered	Yes	Yes	Yes	No	No	No
Buyers	Processed by self	New KCC	New KCC	New KCC, Brookside or processed by self	Final consumers at hotel in Othaya, schools, Brookside or processed by self	Final consumers at milk bar in Othaya, New KCC or Brookside	Milk bars or final consumers in Othaya
Price sold	Not answered	Not answered	Not answered	Not answered	Price paid + 10 ksh/l to schools Price paid + 5-6 ksh/l to Brookside	35 ksh/l to KCC wet season 37 ksh/l to KCC dry season	Not answered
Issues when selling milk	None	None	None	Unpaid debts from processors in 2011	None	Milk rejection by other processors attributed to jealousy	None
Why farmers engage in informal channel	Does not know	Lack of information about the benefits of association	Not answered	Lost of trust in ODCS Pick-up flexibility of brokers	Not answered	Daily payment offered by brokers Early collection time of formal channels	Long payment period of formal channels. Distance to collection points of formal channels.