ORGANIZING MILK COLLECTION IN THE TANZANIAN DAIRY SECTOR

An analysis of milk collection centers in Tanzania

Round Table Africa, SNV, TAMPA

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EXECUTIVE SUMMARY

This report presents the findings of a research conducted from July – September 2009 in the dairy sector in Tanzania. The focus of this research was on the organization of milk collection centers with the aim of ensuring a more stable and reliable supply of milk to the milk processors in Tanzania.

After an initial literature study of value chain literature and literature about the dairy sector in Tanzania the research continued with a stakeholder consultation in order to get a better understanding of the Tanzanian dairy sector. During this phase of the research a typology of 4 different models for milk collection was developed that served as a foundation for the analysis of the data. The models within this typology are: the processor-smallholder model; the NGO-facilitated model; the Cooperative model; and the processor-largeholder model. These models were compared on 15 discriminating variables in order to create a clear distinction between the models.

From these 15 discriminating factors, 5 critical success factors were distilled that are assumed to comprehend the major challenges and opportunities when organizing milk collection centers in Tanzania. These critical factors are: pricing mechanisms; trust & farmer commitment; ownership & power relations; management; and middlemen. Each model was scored along these 5 critical success factors to indicate which its strengths and weaknesses are and where the opportunities and threats lie. During the field research and analysis of the data, several recommendations were developed that suggest how the models can improve on each critical success factor and show what the models can learn from each other.

The strength of this research lies in the fact that a typology is developed for organizing milk collection that can be used and applied in several different contexts. For milk processors this is a useful tool as it provides a rather detailed analysis of their milk collection centers and provides them with the opportunity to learn from the other models. For investors, this information might serve as a guideline or checklist when making investment decisions in the Tanzanian dairy sector. For NGOs and government this analysis is useful because it enables them to identify gaps in the structure of the value chain which they can strengthen and support. And for farmers this report can prove very valuable as it might help develop a more stable market for their milk while at the same time it might create more opportunities for them to develop themselves as professional dairy farmers.
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LIST OF ABBREVIATIONS & DEFINITIONS

CSF  Critical Success Factors
MCC  Milk Collection Center
NGO  Non-Governmental Organization
RTA  Round Table Africa
SNV  Netherlands Development Organization
TAMPA Tanzania Milk Processors Association
TAMPRODA Tanzania Milk Producers Association
TDL  Tanzania Dairy Limited

Largeholder  Large, specialized dairy farmer
Pastoral\(^1\)  Emanating from or pertaining to the use of land for pasture.
Zero Grazing\(^2\)  An animal husbandry strategy in which the plant material is harvested daily and fed to livestock in a dry lot.

1. SETTING OFF: RESEARCH RATIONALE, OBJECTIVES AND APPROACH

1.1 Research rationale

The dairy industry is a relatively small industry in Tanzania. It is slowly recovering from a fast decline in the 1990s when the large state-owned companies were privatized but proved uncompetitive. Many of these companies disappeared and only a marginal milk sector remained in Tanzania. Currently, there are several companies in the market that are slowly expanding but at the same time face many obstacles in this process. The major problems are the strong foreign competition, small domestic market, lack of financial means and difficulties in sourcing large amounts of milk of stable quality.

TAMPA commissioned a research on milk collection, focusing on the regions of Mara and Mwanza. The original aim of the research was twofold. Firstly, to identify locations with a surplus of milk that is not consumed or sold in the Mara and Mwanza regions in order to attract investments for milk collections centers. Secondly, the question was how to organize these collection centers in order to ensure a stable and reliable milk supply.

Extrapolation of an initial impression of the main products, procedures and business principles in the dairy industry in Tanzania began with a field visit to Babati where smallholder farmers are managing their own milk collection centers with the support of a local NGO. In addition, explorative interviews with both key industry informants (e.g., representatives of NGOs, Ministries, Tanzania Dairy Board) and milk processors (in Mara, Arusha, Tanga and Coastal Region) where conducted in order to understand the recent developments in the industry and the economic, technological and institutional issues at play for both processors and producers of milk. Moreover, a desk-study of the available research on the Tanzanian milk industry was conducted. The work of Match Maker Associates (2008) was particularly useful as it included a detailed overview of the value chain of milk.

This preliminary stage, however, revealed that the processors in the Mara and Mwanza regions already possess a detailed knowledge of the availability of milk in both regions and thus where to best collect their milk. Yet, there is limited insight into the organization of such milk collection. Indeed, the preliminary data collection revealed that different models of milk collection centers are operant in the Tanzanian diary regions. By closely examining the
operations of these milk collection centers, the study could provide insight in the advantages and disadvantages of each organizational model found. This information is valuable for all processors in the dairy industry when (a) aiming for improvement of their milk collection and (b) establishing new collection centers. Hence, in consultation with TAMPA and SNV, it was decided to refocus the research on the second aim of this research assignment: the organization of milk collection.

1.2 Research goal and questions

This research aims to contribute insights into the different organizational models in sourcing large amounts of milk of stable quality in order to strengthen the milk processing industry in Tanzania. Hence, the central research question of this research is:

What are the critical success factors in organizing the milk collection from farmers to processors in order to ensure a stable and reliable milk supply in Tanzania?

In order to answer this research question, the following questions will be addressed in this study:

a. Which organizational models for milk collection can be identified in the Tanzanian dairy industry?

b. Which discriminating factors can be used to compare these models?

c. Which are the critical success factors for ensuring a stable and reliable milk supply?

1.3 Research approach

This study adopts an embedded case study approach (Yin, 2003). That is, it examines the milk processing industry in Tanzania by closely analyzing the organization of milk processing in four regions in this country. Data collection and analyses took place from July - September 2009. We proceeded in four stages. The first stage comprised a literature study, conducted prior to field work in Tanzania. The first author performed an extensive literature study of value chain literature to get an understanding of this theoretical and methodological approach. This study resulted in the identification and the acknowledgement of the role of the lead firm in the value
chain and the role other stakeholders can play to develop the value chain and support the lead firm.

The second stage aimed at gaining an in-depth understanding of the dairy industry in Tanzania. This explorative stage consisted of a stakeholder consultation in which the first author made several field visits to stakeholders in the milk industry. Likewise, different documents, secondary data and public sources were consulted. The Matchmakers study (2008) proved particularly helpful in identifying the largest players in the Tanzanian dairy sector. The document also includes a list of all the formalized milk processors in Tanzania which was also used as a reference (Appendix 1). The meetings took place in Tanga, Dar es Salaam, Arusha and Mara. This consultation gave a good impression of the dairy sector and provided a basis for the development of organizational models of milk collection as presented in Chapter 3.

Based on the insights gained in the explorative stage, the third stage focused on sampling the cases for analysis. That is, the selection of the regions and the milk processors. In consultation with SNV and RTA, three regions were chosen. The Mara region was of interest due to the presence of two large processors and limited external support. Arusha was chosen because of the presence of many NGOs that have supported the dairy sector and a few large dairy farms. Tanga was selected because of the involvement of the Dutch government in this region and the particular configuration that resulted from this support. By sampling three regions that differed in organizational configuration and historical context, we aimed at gaining an understanding of the wide range of organizational models in milk processing in Tanzania. We, then, sampled milk processing organizations that represented the organizational models we had identified (see Table 2, Chapter 3). By examining processors that exemplify the organizational models under study through field visits and interviews, we aimed at understanding the discriminating factors of these models and hence their strengths and weaknesses. Appendix 2 presents an overview of the respondents of our study and the field visits conducted.

The fourth stage directly addressed our research questions and is thus the analytical stage of this study. We began by delineating different organizational models of milk collection found in the different regions under study. We found 4 models: the processor-smallholder model, the NGO-facilitated model, the cooperative model and the processor-largeholder model. Then, we compared each model on 15 dimensions in order to identify the discriminating variables
among the models. These 15 dimensions are empirically inspired. Finally, we extracted 5 critical success factors from these dimensions that are believed to contain the main issues in milk collection. Subsequently, the models were compared on each of the 5 critical success factors to determine how and to what extent each model contributes to the overall aim of this study: to enhance the development of a stable, viable and reliable milk supply in Tanzania. Based on our research findings, we finally drafted practical implications and recommendations, departing from the perspective of the milk processors.

During the research multiple data sources were used to increase the validity of the findings. The data were collected at the level of the dairy processor, milk collection center, farmer, NGO and the Ministry for Livestock and Fisheries. Particularly important were the visits to the milk collection centers as these were the unit of analysis. For an overview of the interviews see appendix 2. During the visits a standardized questionnaire was used that enabled cross-case analysis. At each interview similar questions were asked to increase the reliability of the data. Finally, the findings of the research were presented in a session with TAMPA and other stakeholder in the SNV office in Dar es Salaam on September 25th, 2009. During this session the data and findings were validated by the participants thereby increasing the reliability of the findings.

1.4 Outline of the report

In this chapter, we have briefly introduced the rationale behind this research assignment, our key research question and the research approach. In the next chapter, an overview of the Tanzanian dairy sector will be provided, followed by a description of the regional context of the regions that were visited during the field research. In Chapter 3, the organizational models for milk collection will be introduced, providing one of the foundations for the further analysis. In addition, the discriminating factors that distinguish the models will be explained and the different organizational models of milk collection are scored on each of these discriminating factors. In Chapter 4, 5 different critical success factors are identified and analyzed based on the information that was collected in the field research. In Chapter 5 several practical implications are discussed by means of a SWOT analysis (Strengths, Weaknesses, Opportunities and Threats), and some concrete recommendations regarding the critical success factors are
made. Finally, in chapter 6, a general conclusion is provided followed by recommendations for further research and the limitations of the study.
2. THE DAIRY INDUSTRY IN TANZANIA: AN INTRODUCTION TO MILK PROCESSING

2.1 Dairy Sector overview

The Tanzanian livestock population ranks 3rd in Africa, after Ethiopia and Sudan (MMA, 2008). Its large cattle population totals about 18 million cattle, of which most are traditional, indigenous cows (Zebu). Around 1,272,000 households in Tanzania keep dairy cattle, be it as smallholders owning only a limited number of cows (RLDC). 98% of the cows are traditional Zebu cows that have a very low milk production. Only 2% are of improved dairy breed, which have a much higher milk production. Indigenous cattle produce around 49 liter of milk per cow per year while improved dairy cattle produce up to 842 liters per cows per year. The total annual milk yield is around 1,5 billion liters (MLF, 2009). Therefore, the livestock sector is estimated to contribute 5.7% of national GDP, and the dairy sector makes up 30% of that percentage (RLDC).

Most of the farmers in Tanzania are pastoralists (RLDC). They send their wife or children out with their cows to find grazing land and water. This is a traditional farming principle and most farmers still adhere to it. Only in the mountainous regions the zero-grazing principle is more frequently applied. In these regions there are more cross breeds with a higher milk production if they are maintained well. There is no space for free grazing because the land in the mountain is too forested. Therefore, people prefer to keep a limited number of cows in these areas.

Tanzanian total daily milk processing is about 60,000 - 80,000 liters while the total installed capacity in 2006 was about 507,000 liter per day (MMA, 2008; RLDC). This gives a capacity utilization of only 12 – 16%. This low capacity utilization is one of the main reasons behind this study.

2.2 Overview of supply chain

In order to get from raw milk to milk products, several actors are involved. The main actors in the supply chain include: the farmers who produce the milk, the hawkers who sell the milk to the informal market, the traders who transport the milk from the farmer to the MCC, and processors who process the milk. Figure 1 presents an overview of the route of raw milk from producer to final consumer (also see appendix 3).
2.3 Key Players

The number of milk processors has dramatically changed over the past years. That is, the privatization of the government-run Tanzania Dairy Limited in the 1990s caused many factories to close because they were unable to operate efficiently. Out of 35 companies 13 were closed in this period, leading to a sharp decrease of processing capacity (RLDC). This also gave way to foreign competitors to fill this void and serve the urbanized market. Especially Dar es Salaam is an attractive market for foreign competitors due to its large number of inhabitants. Imported milk comes from Kenya and South Africa and the United Arab Emirates. Also milk powder gets imported all the way from the Netherlands.

Currently, the major processing regions are Mara, Tanga, Arusha and Iringa. In Mara there are two large processors (Musoma Dairies and Mara Milk) with a daily production capacity of more than 10,000 liters. Tanga currently houses the largest processor (Tanga Fresh) of the country with a daily
capacity of 50,000 liters and a daily production of around 30,000 liters. Arusha contains one medium-sized processor (International Dairy Products Ltd.) who handles around 4,000 liters daily and several microprocessors that serve their localities and the cities Moshi and Arusha. Finally, there is Iringa where there is one large processor (ASAS Dairies) currently handling around 10,000 liters of milk daily. The equipment for milk processing requires a substantial initial investment, creating entry barriers for new entrants to the milk processing industry. For a complete overview of the dairy processors in the Tanzanian dairy sector, see appendix 1.

Most of the processors in Tanzania are a member of TAMPA (Tanzania Milk Processors Association), which was established in 2001. TAMPA aims “to create a better business environment for milk processing in the country”\(^3\). It serves as a platform for the local milk processors to meet and discuss the developments in the Tanzanian dairy sector. TAMPA also enables dairy processors to submit collective proposals to the central and local governments and non-governmental institutions. As such, TAMPA brings the dairy processors together to speak with one, strong voice.

### 2.4 Main products

The processors in the dairy sector in Tanzania produce a wide variety of products. Many companies produce fresh milk or Mtindy (fermented milk). Also UHT milk is produced in Tanzania but only in Mara by Musoma Dairies and Mara Milk. That equipment requires a substantial initial investment which many firms cannot afford. The advantage of UHT milk is that it can be kept much longer than fresh milk and can also be consumed at room temperature. Also cheese and yoghurt are produced by several firms but the consumption is relatively low. These products are mainly produced for the hotels and resort in the touristic areas and the market is very dependent on tourist seasons.

### 2.5 Challenges to milk processing

The stakeholder consultation identified several challenges milk processors currently face, which are summarized in this section.

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\(^3\) [http://www.tzdairyboard.org/stakeholders/index.php](http://www.tzdairyboard.org/stakeholders/index.php)
Unstable supply. The unreliability of the milk supply is a major problem for the dairy processors in Tanzania. Farmers are often not very dedicated in delivering their milk to the milk collection centers. They are very opportunistic in their behavior and are easily tempted to sell their milk to another processor or to the informal market when offered a better deal. For the processors this results in an unstable supply of milk, which is undesirable.

Seasonality. Another issue for the dairy sector (which enforces the previous issue of an unstable supply), is the seasonality of supply. In the dry season the production is very low and the competition for milk between the hawkers and the processors intensifies. In contrast, in the wet season the milk is abundant and not even all the milk can be sold and processed.

Weak institutional support. The government’s involvement in the sector is not very strong. There is little guiding regulation or support for the companies or the market in general (MMA, 2008). Regarding quality, the government does not indicate what the minimum standard should be. It is left up to the companies to decide their own standards. Also programs to support the market demand for processed milk are weakly organized. For example the school milk program that was initiated by the government several years ago was not sustained. The large informal market is not actively addressed by the government even though selling milk informally is officially prohibited.

Market demand. The market for milk and milk products in Tanzania is a big challenge for milk processors. Official data suggest that people only consume 39 liters of milk per year (MMA, 2008). The WHO recommends that a person should consume about 200 liters per year. In comparison, in Kenya the annual consumption is about 100 liters. This indicates that the demand for milk in Tanzania is very underdeveloped. At the same time, the market is still largely served by the hawkers who operate in the informal market, leaving little opportunity for the milk processors.

Unstable prices. The prices for milk fluctuate a lot. There are large differences between regions and between the wet and dry seasons. In general, hawkers pay a higher price for the milk than the processors. It is difficult to make an exact estimation but it can be assumed that they pay at least 50 TZS more. Prices for a liter of milk at the MCC range from 300 to 420 TZS. However, sometimes farmers receive a lower amount because they sell via a trader who operates as a transporter for a fee. On the informal market the prices can range between 400 and 600 TZS per liter. Yet, this price is difficult to determine as some hawkers go from door to door and charge different prices for each customer.
2.6 Key regions in milk processing

This section describes the regions in which the data for this research have been collected. There are several contextual factors that have an impact on the functioning of milk collection in Tanzania. The geographical context differs per region and therefore explains why some of the models are more prevalent in one region than in another. The contextual factors also have an impact on the performance of these models in the respective regions. The three (sets of) regions that have been included in this study are Mara & Mwanza, Arusha & Kilimanjaro and Tanga. These regions are described according to the following indicators:

Table 1: Regional indicators

| - Climate | - Types of cows | Whether farmers own cross-breeds or traditional cattle |
| - Types of farming | Whether farmers apply pastoralism or zero grazing farming principles |
| - Traditional motivations for keeping cows | Whether farmers keep cattle for social prestige or not |
| - Population | How the population is geographically distributed in the region |
| - NGO presence | Whether many NGOs are active in the region or not |
| - Processor density | Number of processors in a region |

2.6.1 Mara & Mwanza

Mwanza: 2,312,375 cattle (Ref)

Mara: 1,359,791 cattle

In the lake region, a large number of cattle as well as two large milk processors are present. The climate in the Mara and Mwanza regions is relatively dry and hot. Areas close to the Mara River and Lake Victoria have better access to water but many cows are also kept in the inlands areas. These regions have a long tradition of cattle farming but the main purpose of the cow is rarely milk production. Only 0.5% of the cows is improved dairy cattle while the other 99.5% is of traditional breed. These cows give little milk but are very resistant to the harsh weather conditions in the region. In these regions cows are seen as an asset so having many cows gives a lot of prestige and respect. If quick money is needed then a cow is sold for its meat and the income is readily available. In the past, Tanzania Dairy Limited operated in these regions with collection centers in many small villages. It made farmers get used to the concept of milk collection. The current processors are
tapping into that awareness and try to get the milk from the farmers again. Most of the farmers are pastoralists and the zero grazing principle is rarely applied. The regions offer a lot of open terrain where the cows can graze so it is most practical to bring the cows to fertile grazing lands. Also the scarcity of water contributes to the need to apply the pastoralist farming principle.

Part of the population is clustered in small villages but many farmers also live in more remote locations. This limits their willingness to deliver the milk to the collection centers on their own and gives an opportunity for middlemen and transporters to provide this service. There has been little mentioning of NGO activities in both regions and their impact has been very limited. There is no strong tradition of NGO activities particularly in the dairy sector. There are two large processors in Mara that are both located in Musoma. They each have a daily processing capacity of over 10,000 liters per day but suffer from undercapacity. Most of their MCCs are located in the Mara region and some of the centers are located close to each other which creates competition between the centers.

2.6.2 Arusha & Kilimanjaro

Arusha: 1,610,693 cattle
Kilimanjaro: 633,616 cattle

In the Arusha/Kilimanjaro region there is one medium-sized processor and several micro processors present. The land in this region is very fertile due to its elevation but it is also much forested. Especially on the slopes of Mount Meru and Mount Kilimanjaro this is the case implying that there is a stable supply of water. In these regions there are relatively many cross-breed cows that were introduced in the region since the 1970s. The Tanzanian government brought these cows from Kenya after discovering how the sector was developing there. Due to the lack of grazing land the farmers often apply the zero-grazing concept. This also implies that farmers prefer not to keep large numbers of cattle. Feeding the many cows under the zero-grazing principle is very money, time and labor intensive and therefore farmers prefer to keep only 2-3 cows. Calves are sold to neighbors or on local cattle markets. In Arusha and Kilimanjaro traditional reasons for keeping cattle such as prestige play a less important role nowadays.

People in these regions that engage in dairy farming often live in small communities that are scattered on the slopes of the mountains. The variations in altitude complicate the transportation of milk which is why usually only the farmers that live relatively close to a MCC deliver their milk there. The Arusha/Kilimanjaro Region is characterized by a large number of NGOs that over time have been involved in the dairy sector there. These projects have assisted many farmers to organize themselves
and have given them management and financial training. There is one medium-sized processor in Arusha with a maximum capacity of 10,000 liters per day and some micro-processors with a maximum capacity of 1,000 liters per day. Until December 2008, also Brookside from Kenya was actively sourcing milk in these regions\(^4\). Combined with the hawkers that serve the informal markets in Arusha and Moshi it means that there is substantial competition for raw milk.

2.6.3 Tanga
Tanga: 322,351 cattle

In the Tanga region, one large processor as well as some MCCs from processors in other regions are present. Part of the region is mountainous and relatively fertile and there are also several rivers along which cattle farming is feasible. Several farmers have cross-breed cows that were introduced over the years by government farms and heifer projects but there are also a substantial number of traditional cows. Some of the farmers apply the concept of zero grazing for keeping their cows yet pastoralist farming is a common practice as well. Tanga does not have a long tradition for cattle farming so cattle are mostly held for milk and meat production.

The population is scattered over the entire region and there are many small villages. Most MCCs are located in these small villages where the farmers bring their own milk every day. Several NGOs as well as a foundation from the Netherlands (FarmFriends) support the breeding and distribution of improved dairy cows in Tanga. There is one major processor in the area with a maximum processing capacity of about 50,000 liters per day, which has some competition from smaller processors and a processor from another region that also sources raw milk from Tanga.

2.7 In conclusion

This chapter briefly introduced the milk processing industry in Tanzania. For a more detailed overview please refer to the work done by MatchMakers (2008). In the next chapter, we will discuss the different organizational models of milk processing that were identified based on initial interviews and field visits. Drawing on additional interviews and field visits, we will also compare these organizational archetypes along various dimensions. This analysis helped revealing the critical success factors in milk processing (chapter 4) and thus, helped identifying the strengths and

\(^4\) http://www.theeastafriican.co.ke/business/-/2560/593162/-/5y59l6z/-/index.html
weaknesses of each organizational model of milk processing (chapter 5). In so doing, as also stated in chapter 1, our analysis of the milk processing industry aims at providing practical relevance for the actors involved in this industry.
3. THE ORGANIZATION OF MILK PROCESSING IN TANZANIA

3.1 Four organizational models for milk collection

During the stakeholder consultation phase salient aspects were discovered that are important for the organization of the milk collection. These factors were investigated during the field research. Based on the literature review, the stakeholder consultation, and the further findings of the field research a typology of organizational models for milk collection has been developed. This typology includes four different archetypical models that seem to prevail in the Tanzanian dairy industry. Using these models, we aim to comprehend the most important indicators and mechanisms in the organization of milk collection. The typology will be discussed in more detail below.

3.1.1 Processor-smallholder model
This model is the basic model in the typology and seems to be chosen by most processors if there is no external support (e.g. from NGOs or the Government) or existing farmer initiative (e.g. already organized groups) present. The model is based on a direct transaction between the processor and the farmer. The farmer has no obligation to deliver milk to the MCC and is free to switch between MCCs if he wants to. Competition with other processors and/or hawkers is mainly based on price and trust. The processor initiates the milk collection and organizes it according to its own preferences. These actors have no obligation to buy the milk from the farmers if they cannot process it. Farmers groups are not a prerequisite for this model and the use of middlemen is a common practice. Additional services (e.g. advance payment, trainings) are rare because the milk supply is uncertain and variable.

3.1.2 NGO-facilitated model
An important characteristic of this model is the formalized farmer group that at some point has received external assistance. This assistance often comes from NGOs that try to strengthen farmer groups e.g. by means of training and financial assistance. Usually the NGO identifies existing farmer cooperation and tries to develop this into a formalized group. When compared to the farmers in the

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A typology proposes a certain number of ‘ideal types’ to categorize a phenomenon. In contrast to a classification, a typology does not propose mutually exclusive and exhaustive categories. It does provide a degree of clustering that can be useful to reduce the complexity of the phenomenon at hand.
Processor-smallholder model above, these groups are more likely to engage in small-scale processing, and have a relatively high degree of bargaining power vis-à-vis processors. Also, the degree of local involvement is relatively high. Members of the groups feel obliged to deliver to the group because the level of participation and commitment is higher. In most cases, the group manages its own collection and processing and organizes the distribution of the products. Additional services are more likely to be found in this model due to NGO support, which also can entail an improved access to Government services where present.

3.1.3 Cooperative model
This model can be considered as an extension to the NGO-based model. It is established with external assistance and has evolved into a more institutionalized form of farmer cooperation - a union - that (partially) owns its own production facilities. Important in this model is that the farmers own a large share of the company and are indirectly involved in its management. If the farmers are a member of the group this is a good motivation for them to deliver their milk to the MCCs of the Union. Vice versa, being a member they are (almost) guaranteed to be able to sell their milk, even in times of oversupply. There are external services in this model that are usually supported by the organization that was instrumental in organizing the farmers. Theoretically, these services benefit only the members of the union, and they are an incentive for farmers to join a farmer group. Middlemen are not very common in this model because they are not direct members of the union.

3.1.4 Processor-largeholder model
This model represents the direct relation between the processor and the largeholder farmer who is specialized in keeping dairy cattle. These large farms are usually former state-owned farms or established by private, foreign investors. Due to their large supply they have a strong bargaining power vis-à-vis the processor but they can also be dependent on the processor to source their milk. Largeholders are useful suppliers for the processor since they lower transaction costs; they supply relatively large quantities, and the processors have only to deal with one party. As these farms are privately owned they usually receive little external support. There is however a large incentive to invest in their own additional services to improve the production of the cows.
3.2 Research sample

The following table indicates which milk processors and NGOs were included in the research sample. This sample was constructed during the stakeholder consultation phase in which the models for milk collection were determined. After that, the sample regions and actors were selected. This selection was based on the empirical data as well as on practical considerations (time & transport). The table indicates in which regions the actors were located and to which organizational model of milk collection they are attributed.

Table 2: Research sample per region and model of milk collection

<table>
<thead>
<tr>
<th>Processor-smallholder model</th>
<th>Mara &amp; Mwanza</th>
<th>Arusha &amp; Kilimanjaro</th>
<th>Tanga</th>
</tr>
</thead>
<tbody>
<tr>
<td>NGO-facilitated model</td>
<td></td>
<td>C, D, E, F, G, H</td>
<td></td>
</tr>
<tr>
<td>Cooperative model</td>
<td></td>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Processor-largeholder model</td>
<td></td>
<td>D, G</td>
<td></td>
</tr>
</tbody>
</table>

Milk processors and NGOs that were interviewed:

Company A: Tanga Fresh
Company B: Mara Milk
Company C: Musoma Dairies
Company D: International Dairy products
Company E: Llima Numbe
Company F: Land o' Lakes
Company G: West Kilimanjaro Dairy Products
Company H: Nronga Women Dairy
Cooperative Society

3.3 Comparing the four organizational models

In order to advance our understanding of the organizational models in terms of their differences and similarities, we identified several discriminating factors based on our field work (see also the interview guidelines in Appendix 4). In this section we first present the discriminating factors and then score the models on each factor, resulting in Table 3.
1. **Organization of farmers.** This indicator shows the degree of organization of farmers in farmer groups (presence of registered farmer groups) as well as the level of commitment of the farmers to the value chain.

2. **Degree of formalization.** This indicator shows the degree of formalization of the model, as in contractual agreements between the farmer and the processor.

3. **Price setting.** This indicator shows which actor sets the price in the value chain. It can be seen as a proxy for the division of bargaining power in the chain.

4. **Quality of milk.** On which aspects and using which methods is the quality of the milk checked at point of intake (collection center)?

5. **Quantity of milk.** This indicator is comprised of the following aspects: Average capacity at the MCC level, ranking of models regarding minimum required intake to function well, and average dry season collection as a percentage of wet season collection (MCC level data).

6. **Reliability of supply.** This indicator deals with the stability of supply (in terms of quantity as well as quality) from a processors' perspective.

7. **Ownership.** This indicator is comprised of the following aspects: ownership of property, ownership of equipment, purchase of equipment, maintenance of equipment. Property includes the land on which the MCC is located, the premises on which it is located, and the building it is located in. Equipment is taken to include storage equipment (tanks), generator, scales, measuring equipment, and administrative supplies.

8. **Management of Milk Collection Center (MCC).** This indicator comprises of the questions whether the MCC is run by an agent or a manager from the company, and how the risk is allocated between the chain actors (who is liable in case of spoiling of the milk).

9. **Payment of farmers / farmer organizations.** This indicator shows the scores of the models on the importance and prevalence of timely payments to the farmers.
10. Transportation. This indicator concerns the question who bears the costs for transportation, the distances covered for milk collection, and the use of mobile milk collection points in the model.

11. Role of traders / hawkers. This indicator shows the prevalence of hawkers / traders in the model, as well as their desirability from a farmers’ and a processors’ point of view.

12. Financial services. This indicator shows whether credit and loans are made available to farmers and / or their organizations by downstream and / or external actors in the value chain.

13. Input supply services. This indicator shows which input supply services (sometimes called extension services, taken here to include hygiene and animal handling training, availability of in-kind loans such as cow fodder, veterinarian services as well as support with AI or improved cattle breeds) are made available to farmers and their organizations by which downstream and / or external actors in the value chain.

14. Gender. This indicator shows per model at which positions women are involved in the value chain (tending the animals, milking, milk transportation, managing a MCC, processing).

15. Bargaining power. This indicator shows the membership of as well as degree of bargaining power of the actors in the model vis-à-vis the governing / regulating bodies present in the sector, such as TAMPRODA and TAMPA.

3.4 Results of the comparison

Based on our in-depth knowledge of the four organizational models, the models were subsequently scored along the discriminating factors. Two researchers were involved in this process. They, first, scored each model individually; then, compared their results; and finally agreed upon the score. In order to enhance the validity of our assessment, the results (as presented in Table 3) were discussed at a meeting with representatives of TAMPA, SNV and other stakeholders organized in Dar es Salaam on September 25th, 2009. Whereas several remarks were made, the participants agreed with our assessment and thus confirmed the accuracy of our analysis.
Table 3: Discriminating factors of the 4 models of milk collection

<table>
<thead>
<tr>
<th>Factor</th>
<th>Processor-smallholder model</th>
<th>NGO-facilitated model</th>
<th>Cooperative model</th>
<th>Processor-largeholder model</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Organization of farmers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Registered farmer groups</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>N.A.</td>
</tr>
<tr>
<td>Farmer commitment to chain</td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>2. Degree of formalization</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>3. Price setting</td>
<td>Processor</td>
<td>Farmer group</td>
<td>Processor</td>
<td>Farmer</td>
</tr>
<tr>
<td>4. Quality of milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acidity (alcohol test)</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Testing for contamination</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>5. Quantity of milk</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capacity at average MCC</td>
<td>Large</td>
<td>Small – medium</td>
<td>Large</td>
<td>Large</td>
</tr>
<tr>
<td>Avg. dry season collection as % of wet season collection (MCC level data)</td>
<td>41%</td>
<td>49%</td>
<td>70%</td>
<td>40%</td>
</tr>
<tr>
<td>6. Reliability of supply</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quantitative stability</td>
<td>Low</td>
<td>Low</td>
<td>High</td>
<td>Medium</td>
</tr>
<tr>
<td>Qualitative stability</td>
<td>Medium</td>
<td>High</td>
<td>High</td>
<td>High</td>
</tr>
<tr>
<td>7. Ownership</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ownership property</td>
<td>Private/processor</td>
<td>Private</td>
<td>Private</td>
<td>Farmer</td>
</tr>
</tbody>
</table>

6 This factor indicates to what extent the farmers are dedicated to delivering their milk to the formal model of milk collection, and do not engage in selling outside of the model.
7 This calculation is based on information obtained at the collection centers that were visited. The information for model 3 is company data. Since the company is using both the Processor-smallholder model and the Cooperative model for milk collection this figure is only indicative.
8 This factor indicates stability of the milk supply throughout the year.
<table>
<thead>
<tr>
<th>Ownership equipment</th>
<th>Processor</th>
<th>Farmer group</th>
<th>Union</th>
<th>Processor/farmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchase of equipment</td>
<td>Processor</td>
<td>NGO/farmer group</td>
<td>Union/processor</td>
<td>Processor/farmer</td>
</tr>
<tr>
<td>Maintenance of equipment</td>
<td>Processor</td>
<td>Farmer group</td>
<td>Processor</td>
<td>Farmer</td>
</tr>
<tr>
<td>Responsibility</td>
<td>Processor</td>
<td>Farmer group</td>
<td>Farmer group</td>
<td>Farmer</td>
</tr>
</tbody>
</table>

8. Management of Milk Collection Centre (MCC)

<table>
<thead>
<tr>
<th>Agent / Manager</th>
<th>Mixed</th>
<th>Manager</th>
<th>Manager</th>
<th>Manager</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Liability (for spoilage) at MCC gate</th>
<th>Farmer</th>
<th>Farmer</th>
<th>Farmer</th>
<th>Farmer</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Liability between MMC and transport</th>
<th>Farmer in case of manager-run MCC / Agent in case of agent-run MCC</th>
<th>Farmer group</th>
<th>Farmer group</th>
<th>Farmer</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Liability transport to processor</th>
<th>Farmer in case of manager-run MCC / Agent in case of agent-run MCC</th>
<th>Farmer group</th>
<th>Processor</th>
<th>Farmer when bringing / Processor when picking up</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Liability for spoilage at processor level</th>
<th>Processor</th>
<th>Processor</th>
<th>Processor</th>
<th>Processor</th>
</tr>
</thead>
</table>

9. Payment of farmers / farmer organization

<table>
<thead>
<tr>
<th>Importance of timely payment</th>
<th>High</th>
<th>High</th>
<th>High</th>
<th>High</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Prevalence of timely payment</th>
<th>Low</th>
<th>Medium</th>
<th>High</th>
<th>High</th>
</tr>
</thead>
</table>

10. Transportation

<table>
<thead>
<tr>
<th>Distances covered for collection (farmer to MCC)</th>
<th>High</th>
<th>Medium</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Mobile Milk Collection</th>
<th>Some cases</th>
<th>Some cases</th>
<th>Some cases</th>
<th>Some cases</th>
</tr>
</thead>
</table>

11. Role of Hawkers / Traders in model

<table>
<thead>
<tr>
<th>Prevalence</th>
<th>High</th>
<th>Medium</th>
<th>Medium</th>
<th>Low</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Desirability</th>
<th>High</th>
<th>Medium</th>
<th>Low</th>
<th>Low</th>
</tr>
</thead>
</table>

12. Financial Services

---

9 This factor indicates whether payment usually occur on time or not.

10 This factor indicates whether traders are accepted in the model by the processors.
<table>
<thead>
<tr>
<th>Credit (advance payments) made available by:</th>
<th>None</th>
<th>Farmer group</th>
<th>Farmer group</th>
<th>None</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans made available by:</td>
<td>None</td>
<td>NGO</td>
<td>Farmer group</td>
<td>Bank / Investors (external)</td>
</tr>
</tbody>
</table>

### 13. Input supply Services

<table>
<thead>
<tr>
<th>Hygiene training</th>
<th>No</th>
<th>Yes</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal handling training</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>In kind loans, type:</td>
<td>None</td>
<td>Fodder</td>
<td>Fodder</td>
<td>None</td>
</tr>
<tr>
<td>In kind loans, made available by:</td>
<td>N/A</td>
<td>NGO</td>
<td>Processor</td>
<td>N/A</td>
</tr>
<tr>
<td>Veterinarian Services supplied in model</td>
<td>No</td>
<td>Some</td>
<td>Some</td>
<td>No</td>
</tr>
<tr>
<td>AI or improved cattle made available in model</td>
<td>No</td>
<td>Sometimes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

### 14. Gender. Do women:

<table>
<thead>
<tr>
<th>Tend the animals</th>
<th>Yes</th>
<th>Yes</th>
<th>Yes</th>
<th>Sometimes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk the animals</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Transport Milk</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Sometimes</td>
<td>Sometimes</td>
</tr>
<tr>
<td>Manage a MCC</td>
<td>Sometimes</td>
<td>Likely</td>
<td>Sometimes</td>
<td>No</td>
</tr>
<tr>
<td>Process milk</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

### 15. Bargaining power

<table>
<thead>
<tr>
<th>Are farmers member of TAMPRODA?</th>
<th>No</th>
<th>Likely</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Are processors member of TAMPA?</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

---

11 In kind loans refer to the provision of fodder for the cows that can be paid with the earning for the milk.
4. CRITICAL SUCCES FACTORS IN THE ORGANIZATION OF MILK COLLECTION

4.1 The Critical Success Factors

In the analysis presented in this chapter, several critical success factors (CSFs) for organizing milk collection are identified. Those are: pricing mechanisms, trust & farmer commitment, ownership & power relations, management and middlemen. These factors attempt to capture some of the most important decisions that have to be made when organizing milk collection. They combine some of the discriminating factors that were discussed in chapter 3 to create a set of generic features that can serve as guidance in the configuration of milk collection. By no means is this list of CSFs exhaustive, but based on the field research and the observations of the research it treats some of the major decisions a processor has to make. Each model is subjectively ‘scored’ on each CSF, using a scale from -- (indicating a very low score) to ++ (indicating a very high score). The arguments underlying each score will be presented throughout the sections below. As a summary of chapter 4, in table 4, the scores of the models on each CSF will be presented.

4.1.1 CSF I: Pricing Mechanisms

Pricing and payment of the various actors in the value chain are an essential factor in the organization of milk collection. Underlying these issues is the cost structure that is maintained in the various models, both at MCC and at model level (the latter including the farmer, MCC and processor level). The more efficient this cost structure is, the more likely it is that the value generated by the chain can be distributed appropriately between the various chain actors. The data gathered in this study regarding the pricing mechanisms used in the models, however, shows that these structures are arranged differently in each model, leading to varying degrees of efficiency and to different incentives for the farmers for the delivery of milk. The question that underlies this CSF is how to combine the short-term orientation of the farmer with the longer-term orientation of the processor by means of price and input supply services. The models are scored according to the extent to which they do so successfully. As we will see, some models are more advantageous from a farmers’ perspective, and some are more advantageous from a processor’s perspective. In the analysis, these two perspectives will be addressed separately, and the overall score for each model is a result of the aggregation of these two ‘sub-scores’.
As a rule, the prices at the milk collection center are lower than those at the informal market and usually also lower than the prices that hawkers would pay the farmer for his milk (in case he supplies the informal market). The prices paid to the farmer differ substantially per case, note however that this is also due e.g. to the prevailing prices in the region at a certain moment in time. The cost structure of the model, being only one of various explanatory variables for the farmer price, is highlighted here in order to draw some conclusions regarding the pricing mechanisms of the various models.

**Observed cost structures under the Processor-smallholder model:**

(All prices are per liter of milk)

1 A: Agent:

Processor pays to agent: TZS 435
Fee for agent: TZS 15 -
Price for farmers: TZS 420

The operational costs at MCC level\(^{12}\) are for the agent.
The transportation fees are for the processor.

1 B: Manager:

Processor pays to farmer: TZS 300
OR
Processor pays to middleman: TZS 300
Service charge for middleman: TZS 50 – TZS 100 -
Price for farmer: TZS 250 – TZS 200

Operational costs at MCC level are covered by the processor.

1 C: Agent:

Processor pays to agent: TZS 350
Fee for agent: TZS 50 -
Price for farmer: TZS 300

---

\(^{12}\) These include: management salary, diesel for generator, electricity, water, overhead, watchmen and rent for the premises of the MCC.
Operational costs at MCC level are for the agent. Transport costs are for processor,

1 D: Farmer group:
Processor pays to farmer group: TZS 350
Operational costs of MCC: TZS 30 -
Price for member of the group: TZS 320

Price for non-members: TZS 300
(Leaving TZS 20 extra profit for the farmer group)

Operational costs at the MCC level are for the farmer group. Transportation costs are for the processor.

Input supply services
The Processor-smallholder model offers the least access to input supply services (implying services beyond payment for the milk, taken here to include respectively advance payments and loans / hygiene and animal handling training, availability of in-kind loans such as cow fodder, veterinarian services as well as support with AI or improved cattle breeds).

Observed cost structures under the NGO-facilitated model:
2 A:
Price for farmer: TZS 400

All the costs are paid from the profit that is made from selling the milk.
If there is no processing the raw milk is sold to the hawker for 450 TZS. Hawker also buys for this price directly from the farmer.
The profit of 50 TZS is put in a bank account and used to pay for expenses.

2 B:
Price for Farmer: TZS 350

Some milk is sold directly as raw milk, some milk is used for processing
Raw milk is sold on market for 450-500 TZS /liter.
Costs at processor level are: Electricity, water, employees, culture, packaging, transport, firewood

**Input supply services**

In the NGO-facilitated model, when present, input supply services are provided at least initially by the NGO(s) that support(s) the value chain. At a later stage in the development of the value chain the farmer groups that have been formed (with NGO assistance) (should) provide these services, and pay for them from the revenue generated by the chain. However even in this stage they are likely to be facilitated by the NGO.

**Observed cost structures under the Cooperative model:**

**3 A:**

<table>
<thead>
<tr>
<th>Description</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Processor pays per liter</td>
<td>TZS 458</td>
</tr>
<tr>
<td>Transportation costs</td>
<td>TZS 25</td>
</tr>
<tr>
<td>Price for union</td>
<td>TZS 433</td>
</tr>
<tr>
<td>Union fee</td>
<td>TZS 10</td>
</tr>
<tr>
<td>Price for farmer primary</td>
<td>TZS 423</td>
</tr>
<tr>
<td>Primary fee</td>
<td>TZS  8</td>
</tr>
<tr>
<td>Price for farmer</td>
<td>TZS 415</td>
</tr>
</tbody>
</table>

The 415 TZS is multiplied by the number of liters per month. Then, when used, the following costs are subtracted:

**Obligatory costs:**

- Farmers pay 100 TZS for the card that they keep to note the liters of milk they deliver. They pay this fee once a month.
- There is also *amana*, which is some sort of savings. They take the number of liters a farmer delivers and multiply that with 2 TZS/liter. They use the money to give out as small loans.

**Voluntary costs**

- There is a possibility for the farmers to request an advance. This can be given without interest and they will repay the next month with their milk deliveries. This advance can be used for cow feed, sickness, or tuition fees for children.
- *Pembejeo* stands for farmer inputs. It is like an advance for medicine. The farmer group owns a small shop that sells these medicines to the farmers. It is an own initiative of the group.
- Also, farmers CAN order *Pumba*, fodder for the cows.
- There is also an option for SACCOS (individual savings) but this is hardly used by the farmers.
- Payments to heifer project can also be made automatically from the earnings of the milk.

**Input supply services**

The Cooperative model offers the most comprehensive access to input supply services. Farmers (partially) pay for them through the fees at Union and MCC level, which are subtracted from the price they get for their milk as illustrated above.

**Observed cost structures under the Processor-largeholder model:**

**4 A:**

Price for farmer: TZS 400 (will be TZS 500)

Price at local market is currently 500 TZS/liter but will be raised to 600 TZS/liter.
Expenses at the farm are for the farmer.
Processor pays for transportation.

**4 B:**

Price for farmer:
TZS 500 (dry season)
TZS 300 (wet season)

Farmer pays transport.
No sales to local market.
Expenses at farm for farmer.

**Input supply services**

Large farms have better access to credit due to their size, and are therefore assumed to be able to pay for their own non-financial services.

**Pricing mechanisms from a farmer’s perspective**

When analyzing the various pricing mechanisms used in the models, several issues stand out. To start with, when taking the perspective of the farmer, there seems to be a trade-off between price and input supply services. When comparing mechanism 1A and 3A, the milk price to the farmer is slightly higher in model 1A (420 vs. 415 TZS). Although this could be explained by a difference in transportation costs, the farmers in 3A have some obligatory payments to make for services rendered such as the registration cards and, more importantly, the input supply services they are offered. Some of these are offered on a voluntary basis, as can be seen in model 3A. In the NGO-
facilitated model and the Cooperative model, more input supply benefits to farmers and farmer groups are offered, which despite the fact that they are (partially) subtracted from the milk price may lead to an eventually higher reward for the farmer, for example through improved productivity at farm level. The Processor-largeholder model assumes that the largeholder farmers are professional enough to arrange their own access to input supply services, and through their bargaining power (see CSF 3) are able to recuperate these costs (partially) from downstream actors. This leads to the following positioning of the models on a continuum ranging from paying for milk only to offering comprehensive access to input supply services.

*Figure 2: Pricing mechanisms*

Furthermore, as will be discussed in the section on CSF 4, in the Processor-smallholder model MCCs can be operated by either managers or agents. As can be seen in cost structure 1B and 1C (both Mara region), it makes no difference for the farmer whether the MCC is run by an agent or a manager. In both cases he gets 300 TZS / liter. Interestingly, however, in model 1D (which is actually a work-in-progress initiative from Mr Mazara (interview 4-8-2009, appendix 2)), the farmer, being a member of the farmer group, is made a manager at the MCC. 30 TZS / liter are taken to cover the operational costs of the MCC leading to a farmer price (when a member) of 320 TZS, a 6.7% price increase. This is basically a first step towards model 3, as the farmers are organized in primary societies and they are given a stake in downstream value creating processes in the chain. Following this argumentation, the question arises whether it is necessary to have a full-fledged cooperative model in place (including a Union) in order to provide the farmers and their groups with the same or similar advantages. From a farmer point of view, the pricing mechanism can be argued to be optimal when he is either getting the highest price for milk, or a reasonable price and good input supply services. Therefore, even though in absolute terms he gets less money for his milk, he can be argued to still be better off under the NGO-facilitated model and the Cooperative model. Concluding, the pricing mechanism are most beneficial for the farmers under model 2 and 3, so these receive a +. They are not so beneficial from a farmer’s point of view under model 1 and 4, so these receive a -.
Pricing mechanisms from a processors perspective

When taking the perspective of the processor, the pricing mechanism can be argued to be optimal when he is getting low-priced AND reliable milk supplies. Between these two, there is also an inherent tradeoff present, however. For this to be the case the processor needs farmers and farmer groups that are committed to the model (see also CSF 2). The Processor-smallholder model is characterized by a focus on price only, so no input supply services are offered. This represents a short term orientation, and results in little integration between the farmer and the processor. The model seems to stem from necessity, however, as farmers themselves have an extremely short-term orientation, and few developments are in place that would assist the processor with offering input supply services. The Cooperative model in contrast represents a more long term orientation, which is more beneficial from processor’s point of view as farmer commitment is theoretically higher ensuring a more stable milk supply. The Cooperative model however is suffering from the above-mentioned short-term orientation of the farmers, as the model is build on the premise that their loyalty / commitment can be ensured by organizing them in a cooperative model and offering them additional services. In the NGO-facilitated model, the measures taken to improve farmer organization and input supply services are financed outside of the model by a third party (usually the NGO), implying that their costs do not form a direct burden on the chain and thus on the organization of milk collection. This can be argued to represent unfair competition for the processors in other models, as some farmers would enjoy these benefits ‘for free’ while if the processor would want to develop such services he has to make these investments on his own account. Because often NGO-supported farmer groups do not work with the established processors, the larger milk processors are disadvantaged compared to the micro processors in the NGO-facilitated model. Both the NGO-facilitated model and the Cooperative model theoretically work best from a processor’s point of view, as they offer an approach to overcome the short term orientation of the smallholder farmers. The processor-smallholder model does not offer such an approach, and neither does the processor-largeholder model. Therefore, concluding, model 1 and 4 score a -, model 2 and 3 a +. Combining these scores with the scores from the farmer’s perspective, this yields the following final scores on CSF 1: Model 1: -, Model 2 +, Model 3: + and Model 4: -.

4.1.2 CSF II: Trust & Farmer Commitment

In the value chain literature, trust is often operationalized as transaction security. Both parties to a transaction (in this case, the buying of milk at the MCC level) must be willing and able to fulfill their part of the deal, and be able to count on the other party doing the same. Trust has been recognized by all chain and facilitating actors as an essential factor to ensure a reliable supply of milk. The
models are scored here on the degree of trust that exists between the chain actors. Trust from a farmer’s perspective is mainly referred to as reliable payments; from a processor’s perspective reliable intake plays an important role, implying limited or no selling outside of the model (this practice is known as side-selling).

An issue that has to be taken into account here is that there is a significant difference in the importance of trust between the dry and the wet season. In the dry season, competition for milk is high due to limited supply, implying that processors have to be able to rely on the farmers that supply them to actually deliver to them. In this season informal market prices are high however, so farmers are more tempted to engage in side-selling. As is illustrated in Box 1 below, direct selling to the informal market even occurs at MCC level, a practice that can have an even more damaging effect on the functioning of the model. In the wet season, the processors can generally source enough milk; therefore they attach less importance to maintaining good relationships with a particular set of farmers. The challenge, then, for the organizational models for milk collection is to come up with a system that allows for a good relationship year-round, in which some farmers are committed to the chain and are willing to forego short term gains in the dry season and supply to the processor, and the processor intending to buy the milk of those farmers even though there is plenty of supply in the wet season. There is a friction in this type of system caused on the one hand by the short term outlook of farmers and the lack of sanctions for side-selling, on the other hand by the lack of integration and hence of communication between the different chain actors.

**Box 1: Side-selling at MCC level; the consequences of lack of trust**

Side-selling (not delivering to the actors in the model but rather selling to the informal market) occurs not only at individual farmer-level but also at MCC level. Although in some cases the dairy company’s policy allows selling a small percentage of the milk to the local market after collection at the MCC, in one collection center a large discrepancy between this figure and the actual sales to the local market was found. In this particular MCC 25% of the milk was sold at the local market, implying a rather large loss of inputs for the dairy company. The difference between the 8 TZS/liter the MCC could levy as a fee in the model and the profit made from side-selling (85 TZS, based on an informal market price of 500 TZS and a price paid to farmers of TZS 415) proved too great however. As is the case for individual farmer side-selling, no real sanctions were found present that can discourage this behavior.
The assumption here is that trust is a precondition for commitment from the side of the farmers in the value chain. In order to increase farmer trust it is essential to involve the farmer more in the milk collection process. Following this line of reasoning, the level of trust is lowest in the Processor-smallholder model. In this model, which is characterized by transactions at arm’s length, the processor has no obligation to the farmer for buying his milk implying that the milk collection can be ceased at any moment. Vice versa, the farmer is not committed to the chain as this does not yield clear advantages over selling to the informal market. In some cases, attempts are made at establishing more fixed relations (moving towards a relational model), however evidence for this practice is limited. In the NGO-facilitated model and the Cooperative model, trust levels are higher. There are various explanations for this. To start with, in these models members get preference over non-members in milk intake. In the Cooperative model the processor even guarantees to take all milk from the farmers that are members, even in the wet season when they have an oversupply. Secondly, being a member of a farmer group implies that the individual farmers are bound to deliver to the group, and that they are liable (albeit to a limited extent) for damages that occur because of side-selling. Thirdly, farmer commitment is stronger in these models due to ownership of the farmers in the milk collection organization and, in the Cooperative model, even in milk processing. This model is the most integrated model present, approaching a vertically integrated chain in which one actor owns all value adding steps. In the future, it is envisioned that farmers de facto own the entire chain up until the processor, as they are supposed to take a controlling stake in it through the union they are members of. Despite its theoretical advantages however, judging from the side-selling referred to in Box 1, the Cooperative model is not functioning as well as it should. An explanation for this fact could be that communication lines, although perhaps well established, are too long and underused. Finally, in the processor-largeholder model, there is some trust between the farmers and the processors as relatively large quantities are sold. Contractual agreements are more likely to be found in this model, and these can be seen as a trust building element. However, the farmers are committed to their own farm, and not to the rest of the chain. Concluding, this leads to the following scores on CSF 2: Model 1: -; Model 2: +, Model 3: ++; and Model 4: 0.

4.1.3 CSF III: Ownership & Power Relations

Ownership of equipment is a critical factor in the organization of milk collection because it significantly increases the bargaining power of the owning party. In the models, the processor, farmer groups or the union own the equipment for milk collection and cooling. With regard to this CSF, the assumption is that ideally, there should be a balance between the bargaining power of the different chain actors. The models are scored here according to the extent to which such a balance
is present. When ownership of milk collection equipment is equally divided this leads to a balance in bargaining power. Power asymmetries lead to blockages in the chain as when these prevail one actor can for example impose low prices on another. When a value chain is more integrated this implies that switching costs are high for both farmers or farmer groups and processors; the shared ownership of equipment will increase the commitment of the farmers to the MCC as they have made an investment to acquire their share and are partial owners. Therefore if they would decide to switch to another collection center or not deliver anymore at all they would lose their privilege to deliver and lose their share in the MCC. The processor on the other hand cannot simply relocate his MCC because the farmers also own a share. It would bring the relationship of the processor and the farmer to a different level as it creates a strong mutual dependence that will support them in finding a consensus that is acceptable for every party. Having said this, as illustrated in Box 2, farmers and their organizations currently rarely take responsibility for equipment, even when they own it themselves. Another obstacle to this suggestion is that ownership requires organization of farmer groups because no one farmer can make the required investments alone.

**Box 2: Maintenance, who does it?**

One of the interesting findings of this study was that only in the NGO-facilitated model the costs of maintenance of collection and processing equipment were fully carried by the farmers. Even in the Cooperative model where the milk collection equipment belongs to the union, the processor would come to do repairs if the equipment broke down. In the Processor-smallholder model the repairs are assumed to be done by the processor because it owns the equipment. Only when the MCC is managed by an agent the situation is not entirely clear because the agent also bears a certain responsibility regarding maintenance.

Assuming that ideally, a balanced situation with regard to ownership is present, the models perform differently on this CSF. In the processor-smallholder model the processor has a high degree of bargaining power because he owns the equipment. He can set the price and determine the maximum amount of milk he will collect. Alternatively the farmers can sell to their neighbors or family or to the hawker who is perceived as unreliable both with regard to payments and quantities purchased. This increases the dependence on the processor for buying the milk, which is then more able to control the price and decide whether he accepts the milk (according to his needs). In the NGO-facilitated model the ownership is assigned to the farmer group. It increases their bargaining
power (vis-à-vis the processor) because they are not dependent anymore on the processor for the cooling equipment. In case of multiple processors it would enable them to choose the processor that makes the most attractive offer (in terms of price and quantity). In case of there is no processor or the price offer is unacceptable the group may decide to sell the raw milk directly to the market or engage in their own basic processing. In the Cooperative model the ownership is attributed to the union. This implies that neither the processor nor the farmer groups carry full responsibility of the equipment. This integrated system results in mutual dependence of the farmers and the processor. Farmers cannot easily switch to another market while also the processor cannot simply move its equipment away to another region and also takes the responsibility of buying the milk of the members of the union. In the processor-largeholder model the bargaining power seems to be in balance, but for different reasons; the large quantity of milk that the largeholder produces every day needs to be sold while at the same time the processor benefits of sourcing a large quantity from a single location. Concluding, this leads to the following scores on CSF 4: Model 1: -, Model 2: +, Model 3: ++, and Model 4: +.

4.1.4 CSF IV: Management
As illustrated in box 3 below, the models make use of two generic types of management of the MCCs: either the MCC is managed by an employee of the particular dairy company or primary society (indicated with ‘manager’), or the MCC is managed by an agent, who is working for the dairy company on a commission basis (indicated with ‘agent’). The models are scored here according to the extent that they creatively deal with the organization of the management at the MCC.
From a company perspective, the usage of an agent can be justified by the expectation that he is more likely to collect larger amounts of milk and also generate a more stable supply of milk. This is very valuable to the company, but it comes with higher costs because payment is directly related to production. If the supply is high and constant it might therefore be tempting to the dairy company to try to renegotiate the price with the agent. Additional benefits for the company are that this approach requires less monitoring and transfers some of the risks to the agent. In contrast, using an agent gives the company less control over the collection center, because the agent works on an independent basis.

MCCs that are run by a manager are less incentivized to have a high and steady production, because the manager is not paid according to performance. The only credible sanction for the employee is that he can be fired but that does not necessarily give him an incentive to deliver an exceptional performance. Therefore the processor is very dependent on the willingness of the employee to perform well. Since the processor bears all the costs and risks this form of management is not preferred during dry season. However, during wet season or when production is high and constant this form of management is cheaper than that of the agent. In general this type of management gives the processor more control because the manager is directly answerable to the processor.

**Box 3: Manager vs. Agent, payment as a performance-incentive**

Whereas a manager receives a fixed salary from the company (sometimes somewhat higher in the wet season than in the dry season), an agent’s income fluctuates with the milk intake. Although he bears the costs associated with the operation of MCC (salaries of employees, running costs, overhead etc.), there is in theory no limit to his earnings. In one agent-run collection center the average intake is 3500 liters / day (wet and dry season taken together). The agent receives 435 TZS for the milk he buys from the farmer for TZS 420. The levy of 15 TZS is used to cover his costs. This implies that his monthly revenue is 1.5 million TZS, with which costs of 630.000 TZS have to be covered, leaving a profit of 870.000 TZS. In contrast, in one manager-run collection center, the manager earns 150.000 TZS per month, irrespective of the amount of milk collected. This leads to the following conclusions:

- The incentive for running a MCC well seems higher for an agent than for a manager
- However, in lean periods the manager still gets his salary, whereas the agent may make a loss, offsetting earlier gains

From a company perspective, the usage of an agent can be justified by the expectation that he is more likely to collect larger amounts of milk and also generate a more stable supply of milk. This is very valuable to the company, but it comes with higher costs because payment is directly related to production. If the supply is high and constant it might therefore be tempting to the dairy company to try to renegotiate the price with the agent. Additional benefits for the company are that this approach requires less monitoring and transfers some of the risks to the agent. In contrast, using an agent gives the company less control over the collection center, because the agent works on an independent basis.
An interesting situation arises when several collection centers are clustered together that are owned by different companies. In this situation the farmer can choose between at least two MCCs and assuming equal costs (for the farmer to deliver the milk) and milk price (and all other factors are considered under ceteris paribus conditions), management suddenly can become a decisive factor. Then it is up to the management to persuade the farmer to deliver to its collection center. In this case the agent might prove to be more persuasive because he directly benefits from more milk collection.

<table>
<thead>
<tr>
<th>Box 4: Building farmer commitment by agents</th>
</tr>
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<tbody>
<tr>
<td>Some agents have proved to be very creative in giving incentives to farmers to deliver to their collection center. Handing out small presents as matches and salt seem to persuade farmers to continue and increase their delivery of milk.</td>
</tr>
</tbody>
</table>

In the processor-smallholder model, the MCCs that are managed by an agent seem to be more incentivized to perform well than those under management of a manager. In the other models the MCCs are always managed by a manager. This means that at the level of management there is no additional incentive to lobby for increased milk delivery by the farmers. The only moderating factor in the NGO-facilitated model and the Cooperative model is that the manager is often a member of the farmer group meaning that he has an intrinsic motivation for the MCC to perform well. Concluding, this leads to the following scores on CSF 4: Model 1: +, Model 2: 0, Model 3: 0, and Model 4: -.

4.1.5 CSF V: Middlemen

Middlemen have an important role to play in milk collection, both within (traders) and outside (hawkers) the organizational models for milk collection. None of the models seems to be able to outcompete the hawkers that work outside of the models in terms of purchase price for raw milk, implying that there need to be other benefits for the farmers related to delivering to the MCC that the hawker cannot offer. Despite the fact that most models experience the hawkers as an extremely negative factor and an illegal form of competition, they still have to be taken into account when designing a model for milk collection as they have a strong presence in the sector. As a consequence, the models are scored on the extent to which they are able to successfully incorporate the middlemen in the model.
The function that the middlemen fulfill can be useful to both the processor and the farmer. As a transporter, they increase the reach of the MCC thereby giving more farmers the opportunity to deliver to the MCC. This benefits both the farmers, who can sell their milk, as well as the processors, who can collect more milk. At the moment the issue is that the traders are unreliable for both the processor as well as for the farmer. A lack of direct communication between the farmers and the processors give the opportunity for the traders to step in and utilize this void.

Within the models there is a significant difference in the use of traders. In the Processor-smallholder model the traders are most prevalent. Since farmer commitment to deliver to the model is low (see CSF 2), there is a large opportunity for the traders to buy the milk from the farmer. Some of these traders deliver (part of) the milk to the MCC because it pays an acceptable price and forms a secure market for them. In the NGO-facilitated model and the Cooperative model the traders are much less common. This is the case because the farmers have ownership in the model which makes the market-based transaction with the traders less desired. In the processor-largeholder model the trader is rarely observed because they are unable to transport the large quantities that are usually produced by the largeholder farmers. These farmers often own the transportation means and equipment themselves.

At the moment, the Processor-smallholder model makes the most effective use of the presence of middlemen. Most processors argue that they have no problem with the traders delivering to their MCCs. They deliver large quantities and play a functional role by transporting the milk from remote areas that would otherwise not have been delivered to the MCC. However, there are some issues: the traders are sometimes unwilling to sell all the milk they collect to the MCC. In addition, they push down the price that the farmer receives because the farmer has no alternative buyer. This demotivates the farmers to deliver to the processor via the trader. The processor does not have a high degree of bargaining power vis-à-vis the trader and is unable to incentivize the trader to show more commitment to the model and to give the farmer a fairer price. In the NGO-facilitated model and the Cooperative model the lack of control over the middlemen is taken as a reason to consider them untrustworthy and a disturbance to the system. This prevents them from making better use of the potentially complementary services of the middlemen; instead they operate in direct competition with the middlemen and this - especially in the dry season - leads to an unnecessarily high degree of side-selling. Concluding, this leads to the following scores: Model 1: +, Model 2: 0, Model 3: -, Model 4: N/A (Not Applicable).
4.2 Summary of results

Table 4: The Critical Success Factors scored per model

<table>
<thead>
<tr>
<th>CSFs / Models</th>
<th>Processor-smallholder model</th>
<th>NGO-facilitated model</th>
<th>Cooperative model</th>
<th>Processor-largeholder model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pricing Mechanisms</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Trust &amp; Farmer Commitment</td>
<td>-</td>
<td>+</td>
<td>++</td>
<td>0</td>
</tr>
<tr>
<td>Ownership &amp; Power Relations</td>
<td>--</td>
<td>+</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Management</td>
<td>+</td>
<td>0</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Middlemen</td>
<td>+</td>
<td>0</td>
<td>-</td>
<td>N/A</td>
</tr>
</tbody>
</table>
5. HOW TO PROCEED? PRACTICAL IMPLICATIONS & RECOMMENDATIONS

5.1 SWOT Analysis of the models for milk collection

A SWOT Analysis is a strategic planning method used to evaluate the Strengths, Weaknesses, Opportunities, and Threats involved in a project or in a business venture\(^\text{13}\). It involves specifying the objective of the business venture or project and identifying the internal and external factors that are favorable and unfavorable to achieving that objective. SWOT analysis groups key pieces of information into two main categories:

- **Internal factors** – The *strengths* and *weaknesses* internal to the organization.
- **External factors** – The *opportunities* and *threats* presented by the external environment to the organization

In this report, the SWOT analysis is applied to the different models for milk collection as identified in this study, and used as an elaboration on the CSF analysis in the previous chapter, outlining the strengths, weaknesses, opportunities and threats of each model rather than organizing these per CSF as has been done in section 4.1. This allows an easier identification of strategies for milk collection that can be made by combining some of the strong points of the models and avoiding their weaknesses.

5.1.1 Processor-smallholder model

**Strengths**: The strength of the processor-smallholder model lies in the fact that it is the only model in which financial incentives are given to the management of the MCC to improve its performance. This model seems to be most creative in this regard by applying a technique that can increase the stability of the supply substantially. In addition, the processor-smallholder model is the only model in which the middlemen still play an active role. Even though they are not directly employed by the MCC or the farmers, many MCCs receive milk from the middlemen. This increases the range of the MCC and gives more farmers the opportunity to deliver milk to the MCC.

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\(^\text{13}\) http://en.wikipedia.org/wiki/SWOT_analysis
Weaknesses: The pricing mechanism in the processor-smallholder model is weak because it only focuses on competition based on price. It does not offer input supply services that add value to the production process. Trust is low in the processor-smallholder model because there is no obligation from the processor to buy the milk from the farmer, nor does the farmer have the obligation to deliver to the MCC. Opportunistic behavior is common practice which creates a tension between the farmer and the processor. The ownership structure in the processor-smallholder model is also a weakness because the ownership of the equipment that is used at the MCC is fully owned by the processor leading to an imbalanced power relation between the farmer and the processor.

Opportunities: The pricing mechanism in the processor smallholder model offers a great opportunity for improvement. If pricing could be used to give farmers an incentive to develop a more long-term orientation this could be an important stimulus for the development of the dairy sector and the livelihood of the farmers. Trust is directly related to the pricing mechanism and therefore also poses a great opportunity to develop in the processor-smallholder model. Currently, the relation between a farmer and processor is rather weak in terms of durability leading to unreliability in supply. Finally, input supply services are rarely offered in the processor-smallholder model as a result of the loose relationship between the farmer and processor. This hinders the development of the production at the farmer-level and thereby limits the supply to the MCC.

Threats: The major threats in the processor-smallholder model are the seasonality of supply and the development of the NGO-facilitated model. Seasonality leads to an unreliable supply which is a major threat to the performance of the processor. Also, the development of the NGO-facilitated model empowers the farmers but decreases the willingness of the farmers to cooperate with the processors. It is therefore a direct threat to the supply of raw milk to the processors; these two models compete with each other.

5.1.2 NGO-facilitated model

Strengths: The NGO-facilitated model is strong in terms of pricing and in building trust. The pricing mechanism in this model has fostered a long-term orientation by offering input supply services to the farmers enabling them to develop their production. Farmers also feel more committed to this model because they are partial owners of the MCC and the processing equipment/process. This makes them more dependent on the performance of the MCC but they can also benefit when the MCC performs well.
**Weaknesses:** One of the weaknesses of the NGO-facilitated model is the ownership of the equipment at the MCC. As it is entirely owned by the farmers they possess all the bargaining power if they would sell to a processor. Also the management in this model is a weakness as it is not financially incentivized to perform better. The use of middlemen in this model is marginal because they are perceived as a disruption to the direct link between the farmer and the MCC. This is a problem because the farmer is a direct owner of the MCC and therefore prefers to maintain this direct connection. A final weakness of the model is the fact that it seems hard to scale up, meaning that it is difficult to process more than 1,000-2,000 liters of milk daily. In the long run this means that the economic viability of the model can be questioned. The NGOs that are involved in establishing this model will phase out their support at some point in time and are unable to offer or generate a secure market for the milk products. An NGO is not a commercial enterprise so eventually it will likely abandon the milk business and engage in other sectors and activities.

**Opportunities:** The opportunities in this model lie in the payment of management and a closer linkage with the processors in the dairy industry. Particularly the latter is a good opportunity for the NGOs to provide the farmers with more secure link with the market. The NGOs should be more concerned with the sustainability of the model and the development of the entire value chain rather than simply focus on the empowerment of the farmers. As the NGOs will cease their support for a particular farmer group at some point they should enable the farmers to ensure a reliable market for their products. Indeed in some cases farmers engage in micro-processing and serve the local market properly, but in other cases the lack of market access has a direct negative influence on the sustainability of the model. Therefore, NGOs should be more concerned with how the model can link up with the larger processors in order to make the model more sustainable.

**Threats:** A major threat to the NGO-facilitated model is that the NGO that supports the particular farmer group ceases its operations or can simply not provide additional valuable services. At some point the NGO has provided a number of trainings and supporting activities; at this stage the farmer group should be responsible for its own development and obtain assistance when required. If this process does not occur properly then there is a risk that the model collapses.

5.1.3 *Cooperative model*

**Strengths:** The level of trust and farmer commitment is an important strength of the cooperative model. Due to the high degree of involvement of the farmers in the milk collection and milk
processing activities the farmers feel more committed to the model and are less inclined to engage in side-selling to the informal market. As ownership of equipment is attributed to the union in the model there is a shared commitment by both the processor and the farmer groups to make the model work. Also pricing can be considered a strength of the model because the model has a long-term orientation by offering a range of input supply services to the farmers. However, during the field research the researchers observed that the pricing used in the cooperative model was undermined by the processor-smallholder model MCCs that were run by the same processor. The processor offered higher prices under the processor-smallholder model creating direct competition with its other MCCs that were operating under the Cooperative model. This indicates that the model is vulnerable to this type of disruption.

**Weaknesses:** The use of middlemen is a weak factor in the model as these are usually excluded from the milk collection process. Compared to the NGO-facilitated model middlemen are perceived to distort the direct relation of the farmer to the MCC. Also the management in this model is not financially incentivized to improve performance, limiting the collection of milk from farmers that are not a member of the farmer group.

**Opportunities:** An opportunity in the cooperative model would be to include the middlemen in the model. They would enable the MCC to reach more farmers and get a more stable supply of milk. Also management can be incentivized to collect more milk from farmers that are currently not a member of the farmer group that is a member of the union.

**Threats:** It seems that in this model the communication lines already start to become relatively long. This means that farmers start to lose their connection to the MCC and processor and thereby lose their commitment to delivering to the processor. As farmers usually live in remote areas it is easy to lose contact with them because they are hard to reach. Therefore it is imperative that this flow of communication stays clear and as short as possible to maintain the relation with the farmers.

5.1.4 Processor-largeholder model

**Strengths:** The strengths of the processor-largeholder model are mainly based on the critical success factors ownership and trust. The large size of the specialized dairy farms creates an inherent interdependence between the farmer and the processor. Even though the farmer can also sell (partially) to the informal market, selling to the processor would provide him with a stable market
and certainty of a daily income. Also for the processor is this an advantage as he can be sure of a certain minimum quantity every day.

Weaknesses: The weaknesses of this model cannot directly be distilled from the valuation in the critical success factors. Even though the model gets a negative score in the CSFs management and pricing mechanism these are not the true weaknesses of the model. Regarding management it is difficult to incentivize the manager to perform better by means of a performance pay as he will always be limited by the number of cows at his disposal. And even though the pricing mechanism in this model does not directly stimulate a long-term orientation a farmer should have such an orientation to operate his farm profitably. However, the model does have some other weaknesses as well. For example the costs at the farm level are very high. A specialized dairy farm requires a continuous capital investment in order to remain competitive and profitable. In addition, if a farmer does not maintain and develop the quality of his cattle the productivity of the farm will drop. It is therefore essential that a farmer stays on top of things to maintain a profitable level of production.

Opportunities: The opportunities in this model are that it is challenging to bind the farmers to the processors and to prevent them from delivering outside the model. Indeed it is difficult to sell 'single batch' large quantities on the informal market but on the other hand if this milk becomes a premium commodity because it comes from one single farm with a good reputation it might be that buyers prefer this milk over other milk. For processors this is undesirable and they should therefore make clear agreements with the largeholder farmers.

Threats: One of the major threats for this model is the mismanagement at the farm level. If the farmer or manager is unconcerned with the performance of the farm the performance might decrease considerably and will it be unfeasible for the processor to continue deal with the largeholder. In addition, working with only a few specialized dairy farmers also increases the dependence on these farms and their milk production. If, for some reason, many cows would get ill or be unable to give quality milk then this would have a serious impact on the activities of the processor.

When conducting the SWOT analysis, the opportunities and threats seem somewhat more difficult to fill out in the exercise above, as these are related to the context - or external aspects - of the models, in contrast to the strengths and weaknesses that relate to internal aspects of the models, which have received elaborate investigation in this study. These opportunities and threats however, concern
issues such as competition from similar actors, but also the presence of enabling factors (opportunities) or constraining factors (threats) in the institutional environment of the Tanzanian Dairy Industry. In order to shed some light on this part of the SWOT analysis, this environment will be discussed briefly in the following section, and an analogy with the Indian Dairy industry – which is much more developed than the Tanzanian Dairy Industry – will be drawn to highlight the potential of an enabling institutional environment for creating growth in an industry.

5.2 Enabling environment

The institutional environment of a value chain includes norms and customs, laws, regulations, policies, international trade agreements and public infrastructure that either facilitate or hinder the movement of a product or service along the chain. At one end of the spectrum, conventions, treaties, agreements and market standards shape the environment on a global level. The institutional environment at the national and local level encompasses policies, administrative procedures, enacted regulations and the state of public infrastructure. In addition to these more formal factors, social norms, business culture and local expectations can be powerful aspects of the institutional environment. New institutional economists accentuate the behavior-constraining aspect of institutions and speak of institutions as the ‘rules of the game’ (North 1990), which reduce transaction costs and solve problems of information asymmetry (Williamson 2000). In order for an institutional environment to be enabling towards the businesses that operate in it, constraints in the institutional environment have to be resolved, sometimes requiring considerable time, resources and political and social capital. Some countries have managed to create an enabling institutional environment for particular industries, in which the institutions mentioned above are favorable for the actors in the industry, promoting growth and balancing power. As illustrated in Box 5, a good example in the dairy industry in this respect is India. Not only did the Indian Government create an enabling environment by creating ‘helpful’ institutions, it actually actively promoted the dairy sector through its investments.
Box 5: Milk collection in an enabling institutional environment – an example from India

India is the world’s number one milk producer and milk market. The annual production of milk in 2005 amounted to 94 million tonnes a year, or 258 million liters per day. The average annual growth rate of milk production was 4% over the last decade. Multinational companies as well as ‘traditional’ players – Indian companies with a cooperative structure such as Amul in Gujarat state (www.amul.com) and Mother Dairy in Delhi (www.motherdairy.com) – have been expanding their operations in this sector. The organized sector in which the cooperatives constitute around 60% of the processing capacity processes 13 million tonnes of milk annually in 700 dairy plants. Amul, which was established in 1946, pioneered the cooperative model in India.

The co-operative system formed under the so-called Anand pattern has a three-tiered structure. It is composed of the milk producers, mostly residents of the same area, who join a co-operative society. The next level is at the district, and this co-operative (called unions) has as its members the village dairy co-operative societies within the district, represented by the Chairpersons of the village level societies. The third level is at the State, where the co-operative (Gujarat Cooperative Milk Marketing Federation, GCMMF) was formed with district level milk unions (and certain other milk unions from other states) as members. This type of organization, which corresponds closely with the Cooperative model identified in this report, has been extremely successful in the organization not only of milk collection but also of milk marketing in India and abroad.

The success of India as a milk producing country stems largely from the fact that the Anand pattern was replicated throughout India in a large, central Government driven program known as Operation Flood. Due to this movement, the country’s milk production tripled between the years 1971 to 1996. Similarly, the per capita milk consumption doubled from 111 grams per day in 1973 to 222 grams per day in 2000. Operation Flood has helped dairy farmers to direct their own development, placing control of the resources they create in their own hands. A 'National Milk Grid' links milk producers throughout India with consumers in over 700 towns and cities, reducing seasonal and regional price variations while ensuring that the producer gets a major share of the price consumers pay. The cornerstone of Operation Flood has been village milk producers' cooperatives, which procure milk and provide inputs and services, making modern management and technology available to members. The program consisted of 3 phases, and lasted from 1970-1996. During its first phase, Operation Flood linked 18 of India’s premier milksheds with consumers in India’s major metropolitan cities: Delhi, Mumbai, Kolkata and Chennai. During its second phase, the milksheds were increased from 18 to 136; 290 urban markets expanded the outlets for milk. By the end of 1985, a self-sustaining system of 43,000 village cooperatives with over 4 million milk producers had been established. The third phase enabled dairy cooperatives to expand and strengthen the infrastructure required to procure and market increasing volumes of milk. Veterinary first-aid health care services, feed and artificial insemination services for cooperative members were extended, along with intensified member education (Manikutty, 2002).
What can be done in Tanzania?

An increase in the growth rate of the dairy industry in Tanzania, for example through scaling up the Cooperative model is thus to a certain degree dependent on the enabling environment. Currently, however, the institutional environment in the Tanzanian dairy industry is not as enabling as it could be. Several remnants from the time in which the industry was still government-run (e.g. in the form of regulations) still exist today, and have an adverse effect on the actors in the value chain. For example, various and overlapping registrations are required for different Ministries (RLDC, 2009). Moreover, the Government seems unwilling to invest sufficiently in infrastructure in the dairy industry (MatchMakers, 2009). To a certain extent, chain actors such as processors can influence or even co-decide in matters related to governance of the industry by lobbying with relevant authorities or governing bodies, either individually or collectively through a representative organization such as TAMPA or TAMPRODA. This does require a higher degree of chain integration, as this will demonstrate the common objectives of farmers and their organizations on the one hand and processors on the other hand more clearly. On an association level, this implies that TAMPA and TAMPRODA should join hands: TAMPRODA’s mission is also useful for processors, and TAMPA’s mission is also useful for farmer and farmer groups. The institutional environment and the strategies that can be used by value chain actors are however issues that lie beyond the scope of the current research. Nevertheless, they are important, and as such they have been included in the recommendations for further research below.

5.3 General recommendations

In this section we will return to the critical success factors of section 4.1 and give several concrete recommendations for processors on how to improve their performance on these factors. This list is by no means exhaustive so there are also many other possibilities to improve the performance of MCCs. These recommendations are based on the observations made by the researcher and the subsequent analysis. Their purpose is to show the processors several alternatives to their current configuration of the MCCs and stimulate innovative thinking.

5.3.1 Pricing Mechanisms

The pricing mechanism is an important tool for building a relationship between the farmer and the processor. As the basic orientation of the farmer is short-term, his main focus is on the price per liter he receives for the milk. Processors can use this knowledge to their advantage by using the price to
stimulate certain behavior of the farmers. For example, processors can pay a price premium to farmers that have organized themselves in a formalized farmer group. This gives the farmers a direct incentive to organize through one of the aspects that they value most, the price of raw milk. Pricing model 1D (see section 4.1.1) is a good example of such a practice, and should be further developed and tested in the field. In short, this model gives the farmers a financial incentive (premium price) to form a formalized farmer group and manage the MCC.

Adding input supply services adds a long-term orientation to the pricing mechanism that is used in a model. It is only natural that farmers are not willing to change their short-term orientation into a long-term orientation from one day to another. This requires a certain relation to the processor and the model and takes time to develop. Therefore it is of interest to the processor to develop the relation with the farmers by means of price first before he can implement and offer schemes for the acquisition of input supply services that enable the farmers to develop their production.

5.3.2 Trust & Farmer Commitment

As discussed in the analysis regarding this critical success factor, it is imperative that the farmers and processors can trust each other year-round. This requires that transaction security is present for both the processors and farmers, implying close interaction in order to monitor the other party’s performance. Again this is a factor that needs to be developed over time and can be stimulated by the formation of formalized farmer groups. Several strategies have been encountered that create more trust between the processor and the farmer, particularly when taking the seasonality of supply in consideration:

- The basis for farmer organization is education and training on how to effectively manage such a cooperation of farmers. Farmers need to see the benefit of being a member of a group in order to create commitment from their side. The group should have a clear communication structure and should make sure that the farmers feel involved in the process;
- Farmers should also be taught that being a member of a farmer group has legal consequences. If the agreement is to deliver milk to the farmer group then if a farmer does not adhere to this agreement he is personally responsible to the damages that are incurred by the farmer group, in other words, sanctions for non-performance have to be designed and imposed;
- To make long-term participation in a farmer group more attractive it can be a good idea to reward the farmers that perform well. This can be viewed as a bonus or a type of
profit-sharing that stimulates the farmers to develop a stable production. It is important that this reward has a long-term orientation in order to develop the same orientation at the farmers. For example, bonuses should be paid annually or semi-annually in order to determine the stability of supply over both the dry and wet seasons.

Another incentive for farmers to develop a stable supply is a quota system. This means that both in the dry season as well as in the wet season the farmer can deliver the same amount of milk. This offsets the strong position of the farmer in the dry season (where there is a high demand for milk and the farmer is more tempted to go for short-term profits) and the strong position of the processor in the wet season (where there is an oversupply of milk resulting in the situation that the farmers can often not sell all of the milk that is produced). A quota would imply a predetermined supply of milk for the entire year. In that case, the processor is sure to have a certain supply in the dry season, while the farmer also knows that he can sell (at least part of) his milk in the wet season.

5.3.3 Ownership & Power Relations
Ownership of equipment at the MCC gives the owner a strong bargaining power vis-à-vis his counterpart. In the case of the processor, ownership means that the processor has a stronger bargaining power than the farmers because he can move the milk collection equipment at any moment. If the farmers own the milk collection equipment, it means that they are able to decide whether they decide to deliver to the processor or not, giving them a strong bargaining position.

Regarding ownership it seems to be a good idea to share the ownership of the milk collection equipment. This creates a balance of power that benefits the processor in terms of commitment from the farmers and the farmers in terms of certainty of a market and increased bargaining power.

An obstacle to this suggestion might be the lack of capital of the farmers to make the initial investment in the MCC cooling equipment. However, when farmers would be organized in formalized farmer groups this would enable them to apply for loans, grants, etc. and address microfinance institutions that support these kinds of investments. In addition, there are NGOs that can support farmers groups in terms of organization and financial management and help the groups to grow and attract capital.
5.3.4 Management

Regarding management the choice between agent and manager appears to be an important one. There are many factors influencing the collection of milk that might make the choice between the types of management difficult because the available data do not give a conclusive answer which type of management is most effective. Particularly in the NGO-facilitated model and the cooperative model the influence of management on performance is difficult to measure. As the farmers are more committed to deliver their milk in these models the role of management to stimulate the farmers is hard to define. Yet, there are also farmers that deliver their milk to the MCC who are not a member of the group that can be stimulated by the management of the MCC to deliver.

There seems to be a strong case for the agent-managed MCC because the agent has a strong financial incentive to collect more milk. Yet, in none of the models have we encountered a hybrid form of management in the collection center that is based on a minimum steady salary that can be raised by a performance pay according to liters of milk collected. This would give the manager a stable, basic income that can be used to cover the costs of the MCC. At the same time this type of payment still includes an incentive for the manager to raise his performance.

5.3.5 Middlemen

Even though middlemen are not preferred in most models of milk collection, they can serve a very useful purpose in milk collection. Currently, the problem is that they work individually and cannot be controlled by either farmers or processors. They operate on their own account and attempt to maximize their revenues at the cost of the processors and the farmers. Because of their independent approach they have occupied a strong bargaining position in the processor-smallholder model that they wish to maintain.

However, it would be an option to investigate to see if it were possible to integrate the middlemen into the model in cases where they can have a clear added value. For example, the farmers or processor in the model could hire them as transporters of the milk. If farmers would be organized they can discuss a way to include the middlemen in their model and negotiate a better price. Also the MCC can consider hiring transporters to collect the milk directly for the MCC. Transporters would increase the range of the MCC and enable the MCC to source more raw milk. As can be noted, also for this critical success factor it is important to deal with it creatively in order to find solutions that are useful for all parties involved.
6. CONCLUSIONS, RECOMMENDATIONS AND LIMITATIONS

6.1 General conclusion

What are the critical success factors in organizing the milk collection from farmers to processors in order to ensure a stable and reliable milk supply in emerging economies?

- Which organizational models for milk collection can be identified in the Tanzanian dairy industry?
- Which contextual factors have led to the establishment of these particular models?
- Which discriminating factors can be used to compare these models?
- Which are the critical success factors for ensuring a stable and reliable milk supply?

Taking the research question that was posed at the outset of this report into consideration we have developed a set of generic models for milk collection and compared them on different vital parameters. This resulted in an appraisal of the models in which each of the models had its own strengths and weaknesses. For milk processors in the Tanzanian dairy industry it can prove very useful to assess their own models for milk collection according to these parameters and determine the strengths and weaknesses of these models.

An important finding of this research is that farmers tend to have a more short-term orientation regarding the sale of their milk while the processors are considered to have a more long-term orientation with a specific focus on reliability and quality of supply. Their short-term orientation for profits makes the farmers sell to the highest bidder, resulting in direct sales to the informal market or to a hawker. Selling to the informal market usually leads to higher revenues for the farmers than selling to a processor. However, selling to the informal market also has its limitations. A farmer is never sure whether he can sell all his milk against the highest price and the general consensus is that hawkers are not to be trusted, particularly regarding payments. In this sense processors have an advantage, because in general they are able to offer a relatively secure market and steady payments. Especially in the processor-smallholder model, the major motivations for selling to the processor seem to be trust, particularly trust in terms of reliable payment and certain intake of milk, and an acceptable price for the milk. However, opportunistic behavior from the farmers in this model is high, tempting farmers to regularly sell to the informal market if the price is higher. This results in a rather
distant relationship between the farmer and the processor in the processor can never be entirely sure of his supply.

For the processor, ideally, there is a high commitment from the farmers to deliver to their MCCs, resulting in a steady supply in terms of quantity and quality. The processor-smallholder model does not seem to support this farmer commitment strongly, resulting in a daily struggle to source sufficient milk. The NGO-facilitated model and the Cooperative model seem to have created a much stronger farmer commitment and have, despite their own limitations and flaws, better integrated the farmers into the milk collection model. Not only does this give more control over milk supply to the processor, another additional benefit is that it gives the farmers an opportunity to develop themselves and their dairy farming activities, a process named 'upgrading'. It is possible because due to a secure market and the formation of the farmer groups there is an opportunity to develop additional services for the farmers such as animal husbandry training, fodder programs, A.I., etc. In addition formalized farmer groups are better able to attract external support from for example the government, NGOs or microfinance institutions. This upgrading yields benefits both to the farmer as well as to the processor. For the farmer it means that he gets better knowledge about his cows and can increase meat and milk production. For the processor it would mean that he can increase his milk sourcing not only by adding more MCCs but also by developing the currently existing ones.

The Processor-largeholder model seems to be a relatively underrepresented model in the Tanzanian dairy industry. There are rather few specialized dairy farmers in Tanzania and as a consequence, this study has taken only limited data about the model on board. However we can conclude that in essence this model offers a lot of opportunities and can be of great value to the processors. Specialized dairy farmers have the opportunity to deliver large and stable quantities of milk to the processors and can assure good quality. As a processor it seems always a good idea to get involved with specialized dairy farmers (to the extent possible) in order to assure at least partial steady supply.

6.2 Limitations & Recommendations for further research

During this research the researchers have attempted to work in a structured and systematic manner in order to increase its validity. Many actors were visited in order to strengthen the models and to enable a thorough analysis. However, there are also some limitations to the validity of the findings of
this research. As this research has only focused on the Tanzanian dairy sector, the scope of the research is limited. Only a restricted number of case studies were available that had to be visited in a short period of time. The analysis is therefore based on the observations of the researcher made in the limited number of field visits. The researchers attempted to overcome this subjectivity by systematically analyzing the collected data.

A more fine-grained analysis of the institutional environment in the Tanzanian dairy industry, identifying enabling factors as well as constraints, and strategies by chain actors and their associations (TAMPA and TAMPRODA) to strengthen the former and resolve the latter, is essential when some of the more systemic constraints present in the industry have to be removed. These constraints supersede the ability of one actor or even one level of actors in the value chain, and have to be tackled at another level of analysis than the one taken in this report.

Further research in the dairy sector in Tanzania could focus on the differences between the different MCCs within each of the models that are introduced in this report. As these are generic models that attempt to generalize the observations and the collected data the next step should be to investigate how the recommendations can be applied to each MCC within the models. The information from this report should be used to create a hybrid model of milk collection that encompasses mainly positive features.

For the dairy sector as a whole, strong voices were heard in favor of a thorough marketing research. As marketing is a bottleneck for the sector at the moment it would be valuable to investigate how marketing can promote the sector as a whole. Indirectly this also has its consequences for the milk collection, because a larger formalized market decreases the opportunities for the farmers to sell to the informal market. At the same time, it would increase the need for milk of the dairy processors in Tanzania, providing a steadier base for cooperation between the farmers and the processor.
7. REFERENCES


Match Maker Associates Limited (MMA), 2008, *Dairy Sector Quick Scan and Selective Value Chain Analysis Tanzania*.

*Ministry of Livestock and Fisheries (MLF), June 2009*, Dairy Investment Opportunities in the Livestock Sector.


Rural Livelihood Development Company (RLDC), *Dairy Sub Sector Development Strategy*.


### 8. APPENDICES

Appendix 1: Milk processors in Tanzania

<table>
<thead>
<tr>
<th>Location</th>
<th>No.</th>
<th>Plant name</th>
<th>Current status</th>
<th>Installed capacity (lts/day)</th>
<th>Current production (lts/day)</th>
<th>Capacity Utilization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dar-es-Salaam</td>
<td>1</td>
<td>Royal Dairy Products Ltd</td>
<td>Prod. Suspended</td>
<td>90,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Azam Dairy</td>
<td>Operating</td>
<td>3,000</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Tommy Dairy</td>
<td>Prod. Suspended</td>
<td>15,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Tan Dairies</td>
<td>Operating</td>
<td>15,000</td>
<td>4,000</td>
<td>26.7%</td>
</tr>
<tr>
<td>Tanga</td>
<td>5</td>
<td>Azania Dairies Ltd (Ex TDL)</td>
<td>Operating</td>
<td>12,000</td>
<td>6,000</td>
<td>50.0%</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Tanga Fresh</td>
<td>Operating</td>
<td>15,000</td>
<td>14,000</td>
<td>93.3%</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Morani</td>
<td>Operating</td>
<td>5,000</td>
<td>1,000</td>
<td>20.0%</td>
</tr>
<tr>
<td>Arusha</td>
<td>8</td>
<td>Ex TDL New Northern Creameries</td>
<td>Operating</td>
<td>45,000</td>
<td>2,500</td>
<td>5.6%</td>
</tr>
<tr>
<td></td>
<td>9</td>
<td>International Dairy Products</td>
<td>Operating</td>
<td>5,000</td>
<td>1,200</td>
<td>24.0%</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>Arushia Dairy Company</td>
<td>Operating</td>
<td>5,000</td>
<td>2,000</td>
<td>40.0%</td>
</tr>
<tr>
<td></td>
<td>11</td>
<td>Nronga Women</td>
<td>Operating</td>
<td>5,000</td>
<td>2,000</td>
<td>40.0%</td>
</tr>
<tr>
<td>Kilimanjaro</td>
<td>12</td>
<td>West Kilimanjaro</td>
<td>Operating</td>
<td>1,000</td>
<td>300</td>
<td>30.0%</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>Mboconi Women</td>
<td>Operating</td>
<td>1,000</td>
<td>200</td>
<td>20.0%</td>
</tr>
<tr>
<td></td>
<td>14</td>
<td>Marukeni</td>
<td>Operating</td>
<td>1,000</td>
<td>200</td>
<td>20.0%</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>Njynji Women</td>
<td>Operating</td>
<td>1,000</td>
<td>200</td>
<td>20.0%</td>
</tr>
<tr>
<td></td>
<td>16</td>
<td>Kalali Women</td>
<td>Operating</td>
<td>1,000</td>
<td>280</td>
<td>28.0%</td>
</tr>
<tr>
<td>Mara</td>
<td>17</td>
<td>Ex TDL Musoma Dairy</td>
<td>Closed</td>
<td>45,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>18</td>
<td>Ex TDL Utegi Plant</td>
<td>Closed</td>
<td>45,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>19</td>
<td>Baraki Sisters</td>
<td>Operating</td>
<td>3,000</td>
<td>2,500</td>
<td>83.3%</td>
</tr>
<tr>
<td></td>
<td>20</td>
<td>New Mara Milk</td>
<td>Operating</td>
<td>8,000</td>
<td>4,500</td>
<td>56.3%</td>
</tr>
<tr>
<td>Mwanza</td>
<td>21</td>
<td>Victoria Dairy (Kishimba)</td>
<td>Closed</td>
<td>45,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>22</td>
<td>Lake Side</td>
<td>Closed</td>
<td>5,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Kagera</td>
<td>23</td>
<td>Kagera Milk (KADEFA)</td>
<td>Operating</td>
<td>3,000</td>
<td>350</td>
<td>11.7%</td>
</tr>
<tr>
<td></td>
<td>24</td>
<td>Kyaka Milk Plant</td>
<td>Operating</td>
<td>1,000</td>
<td>450</td>
<td>45.0%</td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Del Foods</td>
<td>Operating</td>
<td>1,000</td>
<td>250</td>
<td>25.0%</td>
</tr>
<tr>
<td></td>
<td>26</td>
<td>Mini Dairies (several)</td>
<td>Operating</td>
<td>1,800</td>
<td>1,500</td>
<td>83.3%</td>
</tr>
<tr>
<td>Morogoro</td>
<td>27</td>
<td>SUA</td>
<td>Closed</td>
<td>3,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>28</td>
<td>Shambani Graduates</td>
<td>Operating</td>
<td>700</td>
<td>250</td>
<td>35.7%</td>
</tr>
<tr>
<td>Tabora</td>
<td>29</td>
<td>Ex TDL plant</td>
<td>Closed</td>
<td>5,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Coast</td>
<td>30</td>
<td>Mojata</td>
<td>Closed</td>
<td>6,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Iringa</td>
<td>31</td>
<td>ASAS Dairy</td>
<td>Operating</td>
<td>12,000</td>
<td>5,500</td>
<td>45.8%</td>
</tr>
<tr>
<td></td>
<td>32</td>
<td>CEFA Njombe Milk Factory</td>
<td>Operating</td>
<td>2,000</td>
<td>650</td>
<td>32.5%</td>
</tr>
<tr>
<td>Mbeya</td>
<td>33</td>
<td>Ex TDL plant</td>
<td>Closed/dismantled</td>
<td>16,000</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td></td>
<td>34</td>
<td>Mbeya Maziva</td>
<td>Operating</td>
<td>1,000</td>
<td>500</td>
<td>50.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Several micro-dairies in the country</strong></td>
<td>Operating</td>
<td>83,500</td>
<td>8,350</td>
<td>10.0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>507,000</strong></td>
<td><strong>58,680</strong></td>
<td><strong>11.6%</strong></td>
</tr>
</tbody>
</table>

Source: MLD 2007, Rapid survey

Source: Match Maker Associates, 2008
Figure 2: Map of Tanzania showing Milk Processing Plants

Source: Ministry of Livestock and Fisheries, Dairy Investment Opportunities in the Livestock Sector, June 2009.
### Appendix 2: Interviews

<table>
<thead>
<tr>
<th>Date:</th>
<th>Company:</th>
<th>Presence:</th>
</tr>
</thead>
<tbody>
<tr>
<td>9-7-2009</td>
<td>Tanga Fresh</td>
<td>Rachid Mohammed</td>
</tr>
<tr>
<td>10-7-2009</td>
<td>Tanga Fresh</td>
<td>Alnoor Hussein</td>
</tr>
<tr>
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### Field visits

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Appendix 3: Milk map

Appendix 4: Interview guidelines

- Distance to city
  - If a farmer is located close to the city it is more likely he can sell his milk reliably to the informal market. Therefore this location is less interesting for milk collection because of a more intense competition for the milk

- Number of cows
  - With a higher number of cows it is more likely that a minimum collection of about 500-1000 liters per day can be reached which makes the collection centre economically viable
- Number of farmers
  o The more farmers are concentrated in an area the more likely there is a high number of cows
- Types of cows
  o Are the cows of traditional breed (Zebu) or are they cross breeds? How many cross breeds are there?
- Production per cow. d/m/y
  o Milk production per cow, per day/month/year. How big is the difference between high and low season?
- Production dry/wet season
  o Total milk production per area per month, differentiating high and low season.
- Minimum price of milk for farmers
  o What is the minimum price farmers need to receive in order for them to commit to sell their milk to the collection centre?
- Informal market price
  o What price can the farmers get for the milk if they sell to the informal market? How big are the fluctuations between dry and wet season?
- Maximum radius of collection centers
  o What is the maximum distance a farmer will travel to reach the collection centre?
    What means of transport do they use?
- Reliability of power supply
  o How reliable is the power supply? Do power-cuts occur often?
- Potential for use of alternative energies
  o What is the potential for the use of for example solar and/or wind power to generate a steady power supply for the cooling equipment?
- Availability of land (for grazing)
  o How much land is available for the production of food for the animals. Are there problems with over-grazing and what is the occurrence of the tseetsee bug?
- Availability of financial institutions
  o What are the possibilities to receive financial support to buy better equipment and invest in new, improved cattle
- Availability of processing and cooling equipment
  o Is there any equipment already available in the region?
- Movement of traditional cows
o  Do the farmers (like Masai) move around with their cattle (particularly in the dry season) to find better grazing grounds for their cattle?

- Sense of cooperation
  o  Is there a cooperation network already in place?

- Maximum distance to processing plant
  o  What is the maximum distance between the processing plant and the factory for the processor to collect the milk?

- Education of farmers
  o  What is the highest level of education of the farmers in the town? (with the idea in mind that there needs to be a farmer leader of a potential cooperative)

- Location obstacles? (like holy grounds)
  o  Are there any objections to the specific locations from the local population?

- Availability of clean water
  o  Is there sufficient clean water available in order to clean the cooling facilities and feed to the cows?

- Use of groundwater
  o  In dry areas, can ground water be used to increase water supply?

- Availability of veterinarian services
  o  Are there people in the direct surroundings that have enjoyed higher education and have been trained in veterinarian services?

- Hygiene training
  o  Did the farmers receive any training that taught them to milk the cows hygienically?

- Talk to men or women? Women milk the cows but men are in charge
  o  Who is in charge of milking the cow and who is the decision maker?

- Usage of traders/hawkers
  o  Many farmers use hawkers to transport and sell their milk at the market. They get paid a fee per liter usually. However, if collection centers are established is the use of these hawkers then still justified (due to potentially decreasing distances)?
  o  How transparent are the activities of the hawkers? (in price and treatment of the milk?)