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ASSESSING MILK COLLECTION CENTRE'S POTENTIAL FOR QUALITY
MILK PROCUREMENT AND PROCESSING IN NYAGATARE DISTRICT,
RWANDA: THE CASE OF KATABAGEMU DAIRY FARMERS
COOPERATIVE.

A research project submitted to Van Hall Larenstein University of Applied Sciences in
partial fulfilment of the requirements for the degree of MSc in Agriculture Production
Chain Management, Specialisation in Livestock Chains.

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Assessing milk collection centre's potential for quality milk procurement and processing in Nyagatare district, Rwanda: the case of Katabagemu Dairy Farmers Cooperative.

A Research project submitted to Van Hall Larenstein University of Applied Sciences in partial fulfilment of the requirements of the Degree of Master in Agriculture Production Chain Management, specialisation in Livestock Chains.

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September 2019

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Dedication

This thesis is dedicated to the memory of my late Grandfather Kabahigi Charles (1929-2018), who introduced me to farming. He showed me *Inzira y'inka* – “The way of the Cow”. Out of my heritage came my destiny, May his soul rest in Peace.

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Abstract

This study was intended to Analyse the Dairy Value Chain in Nyagatare District with a case study focus on Katabagemu Dairy Farmers Cooperative. It was intended to assess the potential for Milk Collection Centres to procure and process high quality milk. Stakeholder Interviews, Supply Chain Observation and a farmer focus group discussion were used as a research method to find out the current situation in the dairy value chain and possibilities and strategies for quality milk procurement. A number of tools such as Microsoft Excel, Value chain maps, Business canvas model, PESTEC, and stakeholder matrix were used to analyse the data collected.

The findings revealed that the biggest contributor to milk quality rejects was hygiene at the farmer level. A supply chain observation tool also revealed that the absence of a cold chain contributed to milk rejects as well. It characterized the current business model of dairy cooperatives to be captive after analysis. The findings on the processing market front indicated a dire need for Nyagatare District MCCs to mainstream processing in the sector in order to bridge the Import/export gap being realized on the processed milk value chain. The mechanisms present for upgrading value chains into processing were highlighted by this research.

The Research recommends that Katabagemu Dairy Farmers Cooperative develop a strategic plan to benefit from said opportunities while investing in skills training of the members and organizing milk traders into associations. The research also calls for a stakeholder meeting with the Taskforce Against Milk rejects before the end of the year to develop a sustainability Action Plan for the mechanisms put in place to stop milk rejects.

Chapter 1: Introduction

1.1 Country Description

Rwanda is a landlocked country centred in the heart of Africa on 26,388 square Kilometres. Despite this limited land size, Agriculture contributes to 33% of the country's rapidly increasing GDP. Livestock production equally contributes to a third of the Agricultural Gross Domestic Production (AGDP) in Rwanda. The government of Rwanda regards livestock as an important part in achieving food security for Rwanda, especially in terms of protein requirements and its potential role in poverty alleviation (MINICOM, 2014). Livestock in Rwanda is one of the key pillars for economic growth and poverty reduction as described in the Economic Development and Poverty Reduction Strategy EDPRS 1 (MINAGRI, 2013). It is in this line that the government has implemented a Rwanda Dairy Development Programme to fast track the growth of the Dairy sector (RDDP II, 2016).

1.2 Nyagatare District Description

Nyagatare district is one of Rwanda's 30 districts and is located in the North-Eastern Part of the country bordering both Uganda and Tanzania. The entire District was part of the Akagera National Park until 1994, when the Park's size was reduced and a portion of the area was opened up for human settlement of the returning refugees from a 30-year political exile in the bordering nations. Many of those settling in the new District brought livestock with them. The importance of livestock development in Nyagatare can be attributed to the dedication of the bulk of the District to cattle when land was redistributed after the 1994 Genocide Against the Tutsi. Agriculture is the main economic activity present in this district and Nyagatare's Dairy Sector produces about 45% of all milk produced from smallholder systems in the country. The sector still faces many problems with regards to milk quality, market outlets and value chain sustainability (Rutamu. 2010).

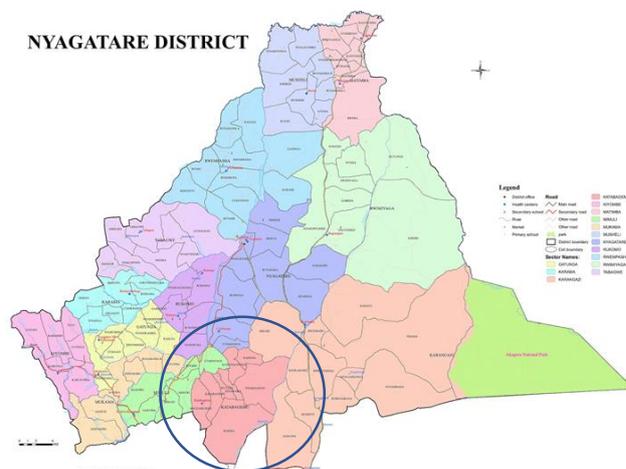


Figure 1: Map of Nyagatare District(National Institute of Statistics Rwanda, 2019)

1.3 Research Background

In Katabagemu Sector (encircled on figure 1) of the district, my family owns a 43-hectare farmland and practices mixed farming with Dairy as the main function. I serve as the farm manager at this ranch and I supervise a permanent team of 7 people with a varying number of casual labourers at any given time of the year. We have a dairy herd of 25 Milking cows, 18 Heifers and dry cows, 8 young bulls, 5 calves and a grown breeding bull. Our average production is 150-200 litres of milk per day and we sell this milk to Inyange Industries, the biggest Milk processor in the country as part of Katabagemu Dairy Farmers Cooperative (KAFCO). KAFCO is made up of 84 dairy farmers who farm in the sectors of Katabagemu and Rubira. KAFCO contributes 3200-3900 litres to this bulking station every day and has

been doing so since its formation in 2006 (Internal documents). It is in this line that I will carry out a research aimed at transforming the dairy sector in my home district beginning with my parent Cooperative as a case study.

1.4 Problem Description

Although Nyagatare district is the largest Milk producing district in Rwanda, the 16 dairy cooperatives present do not process milk. The milk produced, up to 45-65,000 litres is sold to Inyange Industries through Savannah Bulking and cooling station and processes this milk at their Kigali Head quarters. Inyange Industries only accepts grade A milk, and therefore when milk from Nyagatare Milk collection centres does not meet these quality standards, it is rejected. In a meeting with Eastern province dairy farmers in March of 2019, Hon. Minister of Agriculture and Animal Resources pointed out that in Nyagatare district has 16 milk collection centres (MCCs), the largest area dedicated to livestock production and a growing population of over 100,000 dairy cows. Nevertheless, figures from Nyagatare Dairy Farmers Union (NDFU) indicate that 9,358,428 litres of milk were collected from MCCs between June and December of 2018 while 1,688,506 litres were rejected because the milk was found lacking minimum standards (Nsabimana J.D, 2019). This is a cross cutting problem in Nyagatare Dairy Sector and is therefore the main problem of my research.

Main Problem: Poor Quality Milk Procurement at MCC level (KAFCO) that leads to high milk rejection rates

Chapter 2: Research Objective and Questions

Research Objective

To assess KAFCOs Functionality within the value chain in order to address performance hindrances and fast track quality milk procurement at the MCC to access and satisfy growing market for quality milk products in Rwanda.

Main and Sub research questions

Questions 1: What strategies can KAFCO adopt to procure high quality Milk?

- 1.1 What is the current business model and value chain structure of KAFCO?
- 1.2 What are the quality requirements within the current value chain?
- 1.3 What are the factors hindering quality milk production by KAFCO Members?
- 1.4 What strategies can be adopted to tackle the quality hindrances faced by KAFCO?

Question 2: What strategies can be applied for KAFCO and other Nyagatare district MCCs to benefit from the current processed milk value chain?

- 2.1 What is the current dairy products value chain structure in Rwanda?
- 2.2 Who are the stakeholders and their roles within this alternative dairy sector/industry?
- 2.3 What are the constraints in quality milk procurement and dairy product Marketing?
- 2.4 What strategies can be adopted by Nyagatare MCCs to mainstream the processed milk value chain in Nyagatare district

Chapter 3: Literature review and Conceptual framework

This section combines all the data retrieved from desk study from various published sources on the topic of my research. In order to bring clarity to the research process, a conceptual framework is used to magnify the different dimensions and aspects that were developed from the research questions.

Definition of Terms

A **value chain** is a set of activities that a firm operating in a specific industry performs in order to deliver a valuable product or service for the market. The value chain approach will be used in this research to ascertain the different intricacies to look out for while suggesting system changes that affect the livelihoods of farmers.

Below is a catalogue of reviewed literature on the topics tackled during research.

4.1 Nyagatare District Milk Value Chain

The Dairy Value Chain in Nyagatare district is one that can be characterised as **Captive**. In this chain, small-scale suppliers are dependent on a one buyer that often wields a great deal of power and control. (USAID, 2019). The lead firm in our value chain is *Inyange Industries*, the sole processor of all milk from our district. Inyange Industries took over *Savannah*, the only Dairy processing plant in Nyagatare district in 2012 (Times Reporter, 2012) from the Government of Rwanda in order to boost the competitiveness and efficiency of the dairy sector. Inyange Industries is the end processor and wholesaler of all milk in the formal value chain. Despite the importance of formalization of milk market in Rwanda, the majority of dairy farmers are continuing to choose to market their milk using informal channels at 63% at country level.

KAFCO is composed of 92 small-holder farms in Katabagemu sector that collects it's milk from the MCC. KAFCO is also among 16 Milk Collection Centers that deliver their milk to Inyange Industries at Savannah Bulking plant.

The Stakeholders that relate to KAFCO in Nyagatare Value chain can be classified as shown in table 1

Table 1: Stakeholder Roles in Nyagatare Milk Vale Chain

FUNCTIONS	SUPPORTERS	ROLE
Facilitating	Rwanda Agricultural and Animal Resources Board	Facilitate Value chain through continuous improvement on ease of accessing inputs and infrastructure: Extension services (RAB, 2014). Implementation of RDDP. It is an Agency based within the Ministry of Agriculture and Animal resources.
	Ministry of Agriculture and Animal Resources	Provide legislative environment for the chain to operate in
	ACTORS	FUNCTIONS
Input Supply	Veterinary Shops	Sale of Acaricides, Injectibles, minerals and vitamins for animal healthcare
	Sector Veterinary Doctors	Provide extension services as mandated by RAB at the district level
	Private Cattle Feed Seed Suppliers	Some farmers also grow cattle feed plants and grasses. During harvest, these farmers sell seeds.
Production	Small-scale Dairy farmers	Produce milk and supply it to the Milk collection centers
	Sector Cooperatives	These are the parent organisations of the otherwise disorganized small-scale farmers. All small-scale farmers belong to sector cooperatives in order to have access to MCCs
	Large-scale Farmers	Largescale farmers in Nyagatare take their milk straight to their milk boutiques from the farm.
Collection and Bulking	Sector MCCs	Collect Milk for the processing Company
	Nyagatare Dairy Farmers Cooperative Union	District dairy farmers union collecting milk from all 16 MCCs and Sector Cooperatives.

	Large-scale Farmers	The above-mentioned Largescale farmers also collect milk from disgruntled small-scale farmers who don't meet the quality standards set by Inyange Industries
	Milk Traders	These people make agreements with Milk boutiques and Sector MCCs to collect milk and transport it to them.
Processing	Inyange Industries	Sole Processor and milk collector and raw milk. Processing function is pasteurizing and packaging of UHT milk
	Inyange Industries	Sole Wholesaler of Processed milk
Retailing	Minimarkets	Nyagatare district's ambition to compete as one of the 6 secondary cities is coupled with exponential middle class growth that has taken on a habit of shopping. The urban consumers buy Milk from the town Minimarkets. There is also no large-scale supermarkets within the district
	Milk Boutiques	Milk boutiques are predominant in the District. This is where most people go to buy milk for their homes along with other small-scale essentials
Consumption	Urban to High-end Consumers	These are the lower-middle class that buy their milk products from the supermarkets
	Hotels, Cafes and Bakeries, and Institutional consumers	These usually procure milk from the informal chain like milk boutiques, Large-scale farmers or MCCs depending on negotiation
	Rural to low-end consumers	These, the majority of consumers, mainly acquire their milk from Milk Boutiques

4.2 Quality Requirements at Milk Collection Centres.

Milk collection centres serve as bulking stations for small scale farmers and can either transport the bulked milk to the processor or the processor can come by to pick it up. In Rwanda, the MCCs are owned by Dairy cooperatives and the cooperatives are in charge of transporting the bulked milk to the processor. It is at this point that they perform platform tests to ensure that the milk being received is up to par.

Platform tests are tests which give an immediate result, so that the operation of the milk reception at the collection point are performed right away.

According to van de Berg (1990), these tests examine the milk for acidity, smell, abnormalities, density and Acidity

Milk of above-normal acidity is not fit for the production of high-quality milk products. Since tests to ascertain of the exact acidity cannot be carried out at the milk reception, tests that enable milk that exceeds a certain acidity to be sorted out are administered. These tests are the alcohol test and the clot-on-boiling test. For the alcohol test, equal volumes of alcohol and milk are mixed. Depending on the strength of the alcohol, milk with an acidity higher than a certain limit will clot. Usually, 68% alcohol is used. However, not all kinds of milk are equally suitable for this test. In the clot-on-boiling test a small amount of milk is boiled. If the milk curdles, it is not fit for pasteurization or sterilization.

During Transportation of Milk, van de Berg (1990) recommends that milk be cooled within the first 2 hours of milking so as to prevent pathogenic growth as shown in figure 2

Table 12. Theoretical example of the development of bacteria with generation times of 20 and 60 minutes.

Time after the logarithmic phase of massive reproduction started (min)	Number of bacteria	
	species with a generation time of 20 min	species with a generation time of 60 min
0 min	1	1
20 min	2	
40 min	4	
60 min	8	2
1h 20 min	16	
1h 40 min	32	
2h	64	4
3h	512	8
4h	4 096	16
5h	32 768	32
6h	262 144	64
7h	2 000 000	128
8h	16 000 000	256

Figure 2: Pathogenic growth rate in Milk

Source: (van den Berg, 1990)

4.3 Factors Hindering Quality Milk procurement

When analysing the influencing external environment, one finds that Nyagatare districts influencing factors are similar to other developing countries. From the market analysis and environment scan, certain challenges were addressed from the desk study. These can be classified into different categories of the PESTEC tool, which classifies them as Political, Economic, Social, Technical, Environmental or Cultural. Table 3 elaborates on the results.

PESTEC analysis of External Factors in Nyagatare District Milk Value Chain

Table 2: PESTEC

Challenge	Category	Explanation and Source
Low Prices of Milk	Political and Economic	The value share of dairy farmers does not guarantee them, with the current prices of raw milk, security for further investment. Farmers don't make a decent income.
Low Production of Cattle	Economic, Technical	Lack of technical knowledge and appropriate technologies for high production.
Low Producing Cattle Breeds	Economic, Environmental	Very low support for artificial insemination (improved bull semen) and veterinary services (Brittall, 2012).
Death of Cattle	Economic	The biggest losses realized are usually because of death of cattle in our herds due to different diseases. (Ingaju, 2019)
Low income of dairy farmers	Economic	High production is costly, processing and packaging costs are high and preclude investment (Brittall, 2012).
Primitive farming Practices	Social, Cultural and Technical	Lack of functioning milk centres and poor cooling facilities (Dairy Sector Rwanda, 2016).
Low Quality Milk	Technical	Low productivity and lack of quality maintenance practices across the chain leading to low quality grades and standards (Dairy Sector Rwanda, 2016).
Tick-Bourne diseases	Environmental	Lack of efficient extension and veterinary services (Dairy Sector Rwanda, 2016).
Unavailability of Cattle Feeds	Technical	Lack of quality feeds to match the potential productivity of the existing dairy cattle (Dairy Sector Rwanda, 2016).

4.3.1 Gender Analysis

A FAO Study named Gender Assessment of Dairy value chains found that women are less represented than men in most parts of the formal chain and predicted that the promotion of formal chains without due attention to equality might tend to marginalize women even further.

Transportation level - women's participation is almost non-existent. Men carry milk on motorbikes, bicycles, or hand deliver milk to MCCs. Women can only participate through men who are hired to use their bicycles, which reduces their revenues. (FAO, 2017)

Cooperative level - While women are members of MCCs together with their husbands, or on their own if they are single or widows, their participation in cooperative leadership is not significant. Men dominate decision-making positions. The non-participation of women in management and leadership may arise for many reasons. (FAO, 2017)

Processing level - Currently, men and women are employed by the plants, but there could be opportunities to increase the participation of women by encouraging younger, educated women to apply for skilled labour positions. As with MCCs, women are little represented in the leadership and management of processing organizations, and this will need to change if dairy development is to be truly gender sensitive. (FAO, 2017)

Informal markets play a valuable role in supporting local livelihoods and are important for women's livelihoods. However, by being in the informal market, women producers remain small, with limited room for economic improvement; consequently, incentives would be needed to encourage formalization. (FAO, 2017)

Dairy Farming in Nyagatare District is predominantly a male doctrine originating from the patriarchal pastoralist culture. From KAFCOs management structure, It is evident that there is disproportionate gender inclusion. This is an element for further field research

4.4 Rwandan Dairy Products Value chain

The Rwandese dairy industry currently consists of five major processors: Inyange Industries, Nyanza Dairy, Eastern Savannah, Rubilizi Dairy, Masaka Farms plus several cheese processing units mainly located in the Western Province (20 cheese processing units), with a few others being found in other parts of the country (RBS, 2011). Two of these cheese processing units are located in Nyanza District and two more are found in Gasabo District (Karenzi et al, 2013). The main outlets for these processors is retail shops (mini to Super) Markets.

4.5 Dairy Products Stakeholders

According to Makoni et al, the key players in the Rwanda dairy value chain include:

Dairy Stakeholder Organizations: Cheese Makers Association, Milk Sellers Association, National Federation of Dairy Farmers, Nyagatare Dairy Farmers Union, and Rwanda National Dairy Platform (under the Private Sector Federation of Rwanda).

International NGOs and funding agencies: Dutch Embassy, FAO, Global Communities, Heifer International, IFAD, Land O'Lakes (USAID-funded RDCP II), Send a Cow, and SNV

Processors: Blessed Dairies, Inyange Industries, Masaka Dairy, Nyanza Dairy Plant, Rubirizi Dairy Plant, and Zirakamwa Meza Nyanza Dairy Ltd

Public Sector Institutions: Livestock Infrastructure Support Program (LISP), Ministry of Agriculture and Livestock Resources (MINAGRI), Ministry of Trade and Industry (MINICOM), National Agricultural Export Development Board (NAEB), Rwanda Agriculture Board, Rwanda Agriculture and Livestock Inspection and Certification Services (RALIS)

4.6 Constraints for quality milk product procurement and Marketing

“Rwanda imports over 40 tonnes of cheese annually. This can, however, be reversed if you work closely and increase cheese production to replace imported cheese that had dominated stalls in various supermarkets,” Said the current chief of operations in RDB at a cheese awarding event. Nine companies; Muhe farm ltd, Fromagerie le Reine ltd, Gishwati farms ltd, Local Cheese Promotion ltd, Gishwati Mountain Farm ltd, Urugyero, Royal dairies, Ingabo dairies and Les Cavabon took part in the competition (Times Reporter, 2014). Since 2014, Cheese imports have increased from the mentioned 40,000 to 45,000 in 2017.

According to Makoni et al, Weaknesses of the dairy sector include but are not limited to:

- Lack of milk quality-based pricing system,
- Informal milk trading compromises milk quality & outcompetes processed products,
- Lack of recording systems and credible sources of data to facilitate planning,
- Farmer share of final retail price is low, 16%, compared to 50% elsewhere – can discourage production,
- Lack of an effective public and private dairy coordinating body,
- Inadequate dairy platforms to lobby for the sector (Makoni et al., 2013)

4.7 Conceptual Framework for Research

From the research questions and literature review, a Conceptual framework for this research was developed as shown in Figure 3.

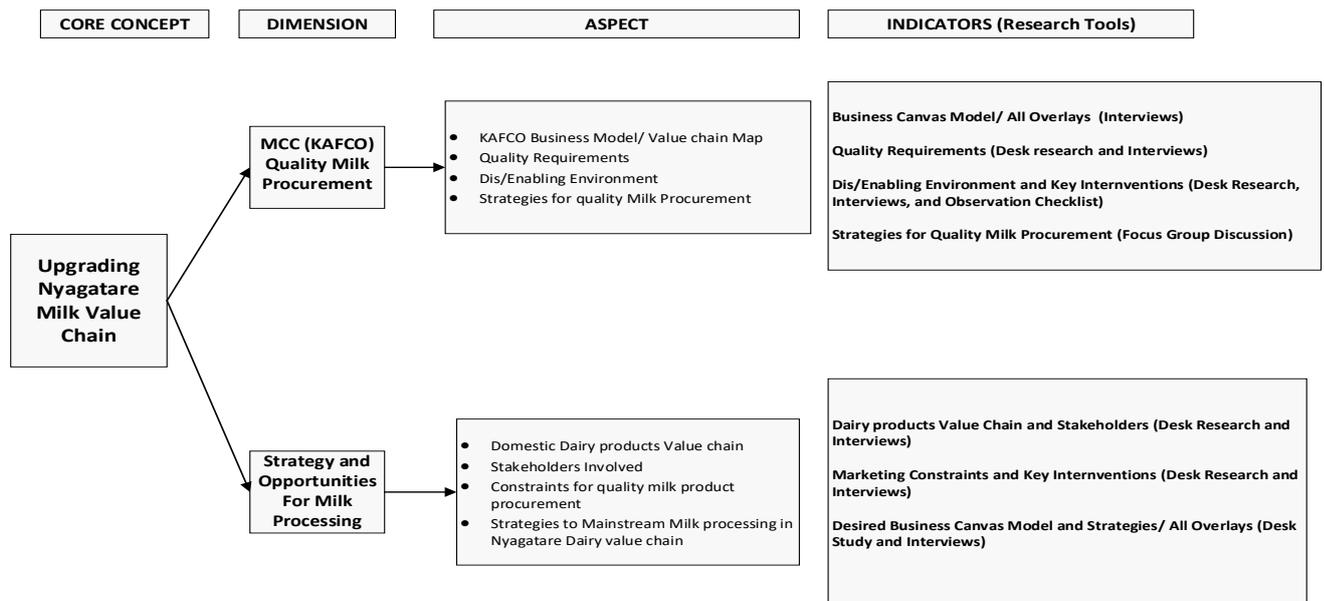


Figure 3: Conceptual Framework for research

Chapter 5: Research Strategy and Methodology

5.1 Research strategy

This is a value chain analysis of the dairy sector in Rwanda and feasibility study on the potential to eradicate milk rejects at KAFCO. Qualitative and quantitative data were collected and analysed using the following strategy

Research Framework

During the research, data was collected through different data collection tools that were operationalized using a the research framework shown in figure:4

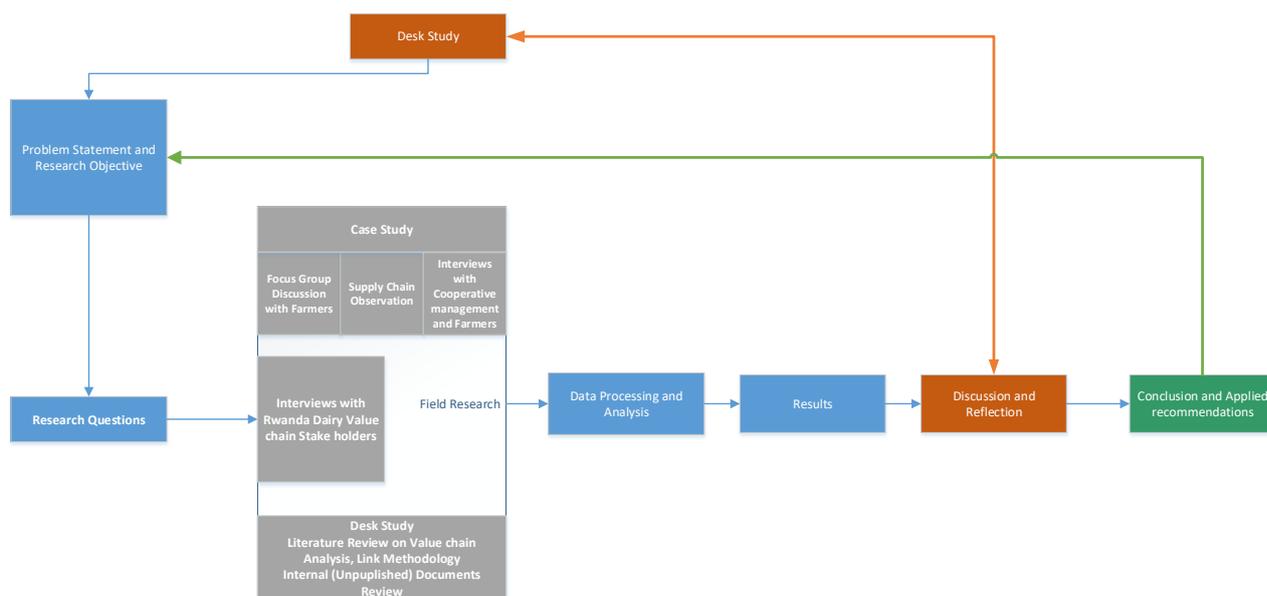


Figure 4: Research framework

5.2 Data Collection Tools

The tools used for data collection are the following:

1. Desk study and literature review – Conceptualisation and Scoping

Study Area: Rwandan

This method was used to analyse secondary data, and to review literature. Sources for the desk research were, relevant books, journals, literature and important documents, using Greeni, search engines and google scholar. Harvard referencing was used. I focused on the Rwandan dairy industry and triangulated the relevant data with my field research findings

2. Stakeholder Interviews (22)

Study Area: Nyagatare District and Kigali City

Stakeholders within the Nyagatare Dairy value chain and others in the Rwandan Processed milk Value chain were interviewed on key information affecting quality of milk products and potential to upscale processing at the Milk collection centre. The interviews were used to collect Qualitative data from the following representatives:

3. Focus Group Discussion (1)

Study Area: Katabagemu Dairy Farmers Cooperative

Cooperative Members and Cooperative leadership were present. The objective of the focus group discussions is to train the cooperative members on the Value chain concept, address the quality milk procurement hindrances and develop strategies to produce high quality milk

4. Supply Chain Observation (1)

Study Area: KAFCO

The Supply Chain Observation Checklist was used to identify how milk is delivered to KAFCO and identify the different challenges encountered along the value chain. It was taking into consideration factors like Temperature, Hygiene, distances and quality related activities carried out along the supply chain

5.3 Research Methodology

The Research methodology can then be summarized and operationalised into the following plan:

Table 2: Research Methodology Operationalization

Sub question	Data	Data source	Tools for data collection	Tools for analysis
1.1	Current Dairy Value chain structure, KAFCOs Business Model, Stakeholders and their roles	Desk Research, Farmers, Cooperative management, stakeholders and supporters	Internet, Journals, Articles, Interviews (Checklist)	Chain Map, Stakeholder Matrix, Business Model Canvas
1.2	Existing quality requirements	Desk Research, Farmers, Cooperative management, stakeholders and supporters	Internet, Journals, Articles, Interviews (Checklist), Observation (Checklist)	Supply chain Map
1.3	Current Hindrances to quality milk procurement	Desk Research, Farmers, Cooperative management, stakeholders and supporters	Internet, Journals, Articles, Interviews (Checklist), Observation (Checklist), FGD (Checklist), MapMeasurePro	Problem Tree
1.4	Strategies for quality milk procurement	Desk Research, Farmers, Cooperative management, stakeholders and supporters	Internet, Journals, Articles, Interviews (Checklist), FGD (Checklist)	

2.1	Current Dairy Products Value Chain structure,	Desk Research, Processors, Retailers, stakeholders and supporters	Internet, Journals, Articles, Interviews (Checklist)	Chain Map
2.2	Stakeholders Involved and their roles	Desk Research, Processors, Retailers, stakeholders and supporters	Internet, Journals, Articles, Interviews (Checklist)	Stakeholder Matrix
2.3	Constraints to dairy product procurement and Marketing in chain	Desk Research, Processors, Retailers, stakeholders and supporters	Internet, Journals, Articles, Interviews (Checklist)	
2.4	Strategies for milk processing, Import/export data	Desk Research, Processors, Retailers, stakeholders and supporters	Internet, Journals, Articles, Interviews (Checklist), Unpublished internal documents	

Chapter 6: Results

This section is composed of my research findings detailed and organised under the different research aspects of my contextual framework in section: 4.7

6.1 Strategies for Quality Milk Procurement

This section contains results that have been triangulated between research tools and respondents in order to answer Research Question 1.

6.1.1 KAFCO Business Model and Value Chain Structure

The value chain structure and business model of KAFCO were derived from interviews with the cooperative management and staff. According to Key Informant 2, KAFCO's management is governed by a board of 5 members of whom 2 are chairman and vice chairman and the other 3 are advisors and auditors. The cooperative of 92 farmers employs 8 workers, of whom 3 are women. KAFCO supplies a total of 3200-3900 litres per day to Savannah Bulking station. Figure 5 shows the management structure of KAFCO and their roles.

Management Structure of KAFCO

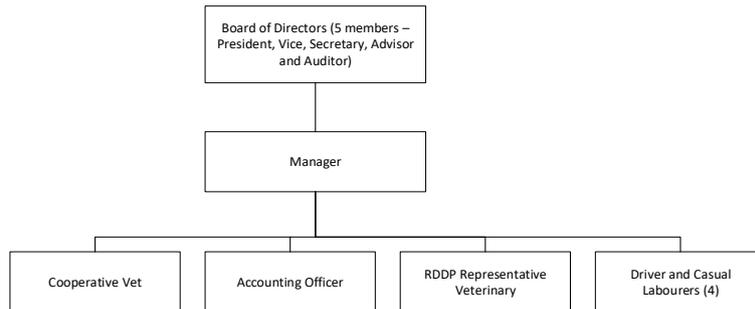


Figure 5: Management Structure of KAFCo

Business CANVAS of KAFCO

The CANVAS model was used to determine the functionality of KAFCO within the value chain using annex 1 as a questionnaire with Key respondent 2. Table 3 is the outcome of this interview. It is from this CANVAS model that we derived KAFCO's value chain structure in order to calculate the value shares across the different actor within the chain.

Table 3: Business Canvas Model KAFCO

<p><u>Key Partners</u></p> <ul style="list-style-type: none"> ❖ Heifer International ❖ Land O'Lakes International ❖ RYAF ❖ RAB ❖ Inyange Industries ❖ RALIS ❖ Bank of Kigali 	<p><u>Key Activities</u></p> <ul style="list-style-type: none"> ❖ Selling of Raw Milk ❖ Provision of transportation services ❖ Provision of Veterinary services ❖ Provision of Cattle feed supplements 	<p><u>Value proposition</u></p> <ul style="list-style-type: none"> ❖ <i>Provision of high quality raw milk in order to create wealth for cooperative member farmers</i> ❖ <i>Provision of good Milk delivery services for other MCCs</i> ❖ <i>Provision of high quality veterinary services for member farmers and cattle feed supplements</i> 	<p><u>Customer Relation</u></p> <ul style="list-style-type: none"> ❖ Transportation of Raw Milk from MCC to Savannah plant done by KAFCO Truck ❖ Telephone communication of Truck bookings ❖ Veterinary/Feed Supplement services paid in Milk supplied 	<p><u>Customer segment</u></p> <ul style="list-style-type: none"> ❖ Inyange Industries, Savannah Plant ❖ Musenyi Sector Dairy cooperative (Abarwanashyaka) ❖ KAFCO Member farmers
	<p><u>Key resource</u></p> <ul style="list-style-type: none"> ❖ Transportation Tracks ❖ Milk Cans ❖ Storage Facilities ❖ Coolers ❖ Generator ❖ MCC Office HQs with MCC Hub Requirements ❖ Skilled Employees 		<p><u>Channels</u></p> <ul style="list-style-type: none"> ❖ On-site sales ❖ Telephone communication Veterinary Services and Truck Booking ❖ Transportation trucks 	
<p><u>Cost structure</u></p> <ul style="list-style-type: none"> ❖ Employee Wages ❖ Fuel Costs and Maintenance Costs ❖ Cost price of Veterinary Medicines and Feed Supplements 			<p><u>Revenue Stream</u></p> <ul style="list-style-type: none"> ❖ Truck Rental Services ❖ Veterinary Services ❖ Raw Milk Supplied value share 	

❖ Loan repayments for past credits	
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KAFCO Value chain

From Interviews with Key Informants (2, 13, 14 and 16), a detailed value chain map showing the value chain actors associated with KAFCO in figure 6 During these interviews, a checklist in Annex... was used.

Value chain Structure of KAFCO

Figure 6: Current Value chain structure KAFCo



Stakeholder roles

From the Stakeholder interviews I conducted with Key Informants (1-14) in Nyagatare Dairy Value chain, I came up with a stakeholder matrix that represents the situation on the ground.

Since the beginning of 2017, Nyagatare District dairy value chain has seen an influx of development funds that aim at increasing her potential in the country's dairy sector. The Stakeholders and their roles that were not mentioned within the literature study and have since become enablers in KAFCOs value chain include:

- Rwanda Youth in Agriculture Forum – Charged with providing permanent staff to monitor quality of milk at each cooperative in Nyagatare District
- Rwanda Reserve Force – Charged with all renovation and construction works being done at MCCs
- Heifer International – This is a stakeholder that has been working with the “girinka” programme that gives every poor family a cow.
- Land o’Lakes – Works with supplying post-harvest equipment such as milk cans and coolers
- Rwanda Council of Veterinary doctors – Charges with training and certifying all private and public veterinary doctors within Nyagatare District

- Business Development Fund – Responsible for tracking and tracing loan repayment of RDDP funds
- Local government administration – Signed a Memorandum of Understanding and was charged with vaccination of cows and Artificial insemination services

All the enablers and major chain actors are grouped together under the **Task Force against Milk Rejections**. In May 2019, the Ministry of Agriculture implemented a taskforce charged with solving the problem of milk rejections at the Savannah Plant. This taskforce has since become a hub for all enablers in the value chain to work together to solve any arising milk quality problems. The task force is coordinated by the ministry and has for the last 3 months stopped milk rejects at the Savannah Bulking station by supplying all MCCs with Cooling tanks and verifying that the supply chain meets the standards of the ministerial order number 001/11.30.

Stakeholder Matrix A stakeholder matrix is going to be used to examine the level of interest and influence that all the stakeholders involved possess.

Table 4:Stakeholder Matrix

INTEREST	A. High Interest/ Low Influence	B. High Interest/ High Influence
	<ul style="list-style-type: none"> • Small-scale Dairy farmers • KAFCO 	<ul style="list-style-type: none"> • Taskforce against Milk Rejections • Savannah Plant
	C. Low Interest/Low Influence	D. Low Interest/High Influence
	<ul style="list-style-type: none"> • Input Suppliers 	
	INFLUENCE	

6.1.2 Quality Requirements within the Current Value Chain

To answer research question 1.2, I used interviews and a Supply chain checklist to verify the and triangulate the results of each tool.

Milk Tests required

4 interviews geared towards understanding the traceability and deterrence of quality based milk rejects confirmed that several tests were being carried out to reduce milk rejects. According to Key Informant 1 and 2, MCCs are required to cool raw Milk to 3°C not longer than 2 hours after milking in order to inhibit pathogen generation by Ministerial order number 001/11.30. KAFCOs management ensures that Organoleptic, Alcohol tests (80% alcohol), Lactometer/Density and antibiotic residue tests are observed at the MCC. If milk is observed not to meet the following, the milk is immediately rejected at the MCC.

Key Informant 1 also specified that the comprehensive milk tests done at the bulking station include:

- Organoleptic Test (For sensory anomalies in Milk)
- Alcohol Test (For Adulteration)
- Resazurin Test (For Bacteria)
- Antibiotic Test (For withdrawal period criteria observation)
- Aflatoxin Test (For Cattle feed criteria observation)

- Composition Test (e.g Lacto scan to analyse Milk composition)
- Somatic Cell Count Test

These tests ensure that Cooperatives/MCCs provide Milk fitting a low level of bacteria, unadulterated milk without residues of antibiotics or aflatoxin, with a chemical composition set by Rwanda Bureau of Standards.

6.1.3 Factors Hindering quality milk production of KAFCO Members

KAFCOs Milk Collection Centre has a similar supply chain to the other 15 MCCs in Nyagatare District. It collects raw milk from small holder farmers in the area who deliver their milk either at the MCC or at its remote MCPs. To answer research question 1.3, I decided to analyse the factors that affect the quality of milk at the MCC throughout the whole supply chain by way of observation. To do this, Annex 1 was prepared as an observation checklist as I accompanied the Cooperative driver on 2 separate occasions. This was to complement the quality of my interviews and my FGD.

Supply Chain Observation

Small holder farmers that live in remote farms of Katabagemu sector supply their milk at the MCPs. It is from here that KAFCO collects the milk in a Toyota truck seen in figure 7 KAFCO then takes the milk from the MCPs to cool at the MCC in 2 cooling tanks to a CCP of 3°. It is from here that KAFCO loads the bulk sum of the milk collected at both the MCPs, and milk delivered at the MCC by farmers on bicycles and motorcycles every morning, to Savannah Bulking station.



Figure 7: Toyota Milk Transportation Truck

Figure 8 Shows the activities, distances, travel times, and Quality assurance tests done at every point in the KAFCO supply chain. Pictures from every point within the supply chain of KAFCO can be found in Annex 5

Supply chain Structure of KAFCO

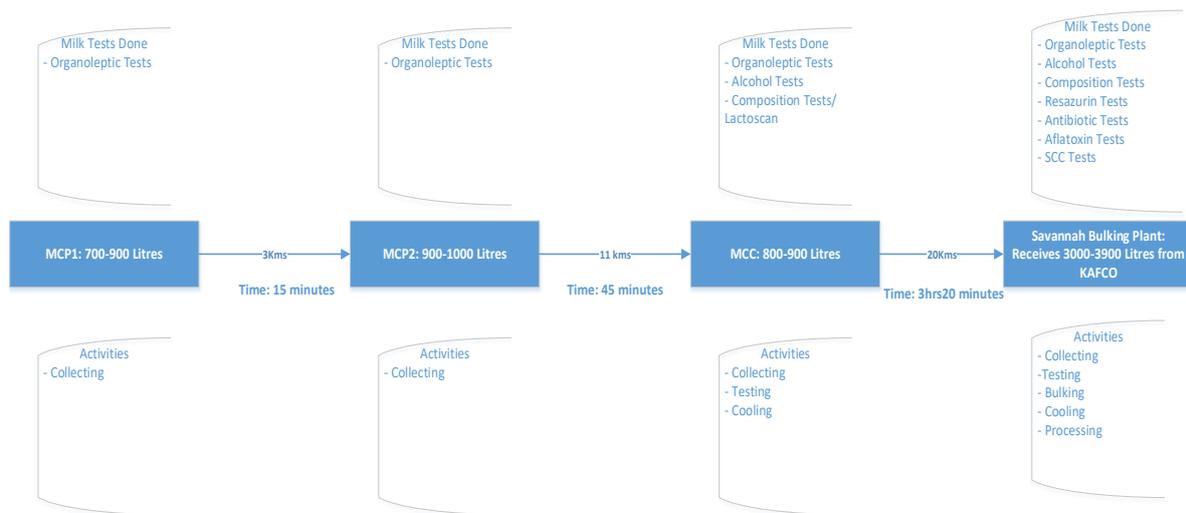


Figure 8: Supply chain Structure KAFCO

Contamination points within KAFCOs supply chain

1. It is evident from the pictures in Annex 5 that MCPs construction has not been completed and therefore certain conditions for quality milk procurement have not been met.
2. The farmers and milk tradesmen use dirty water to wash their cans after delivery
3. Some farmers in the remote parts still deliver their milk in Jerricans as seen in annex contrary to testimony given by key informant 1 &2.
4. Platform tests that take into account Antibiotic residue and bacteria count are done only at the Savannah bulking plant. Therefore, if there is any milk added that is not of good quality, it will be rejected at the plant.
5. The truck travels long distances and has a long waiting period at the plant and so give way for pathogen multiplication in the milk.
6. The supply chain observation tool however showed that it is impossible to meet the CCP set by the ministerial order as none of the MCCs have transportable coolers and storage tanks and that the time from the MCC to Savannah bulking station is usually a 3.5 hr total process especially in the case of KAFCO because In addition to the long distance travelled, trucks have to line up in order of arrival at the bulking station that incurs more time as well and this can be observed in Annex 5

Summary of Finding on Hindrances to Quality Milk Procurement

1. Key Informants 9, 18 and 19 pointed out that the most evident factor is that hygiene at production level is not really observed by farmers. Most members are “Telephone Farmers” meaning that they have other jobs in Kigali city and so the management of their farms is left to the workers/herdsmen and this does not give 100% assurance to management with regards to quality requirements. Hygiene also also contributes to the very high somatic cell count in Nyagatare milk as many litres are rejected because of Mastitis issues.

2. Milk traders also lack awareness when it comes to testing milk from the remote regions of Katabagemu farms as they bulk it to supply KAFCO. Milk that is usually rejected by the MCC is traced back to the milk traders who don't measure the quality of milk at production level.
3. The MCC was funded by the Post-Harvest Agribusiness Support Project (PASP) to acquire 2 milk coolers with a total capacity of 5000 litres but not a storage tank. This has been a challenge because as soon as milk reached the CCP of 3°C it is expected to be transported to Savannah Bulking station right away. This is not realistic as the Bulking station may be undergoing maintenance every once in a while and may not be accepting milk. It is a waste of resources because the MCC would have nowhere to put the next milking. This is a problem that was later experienced during the course of my research on the 12th and 19th of July (See section 6.2.2)
4. During 2017, Rwanda Dairy Development Programme (RDDP) constructed Milk Collection Points (MCPs) that had to serve as secondary locations for Cooperatives to collect milk from remote farmers. KAFCO has 2 Milk collection points that have not been built to fit the standards required to collect quality Milk. KAFCO's MCPs lack the basic requirements of MCPs detailed in Ministerial order 001/11.30. There is a need to finish their construction and provide them with the Milk testing equipment in order to reduce the workload at the MCC.
5. Nyagatare district is a region most affected by climatic conditions whereby the availability of pasture greatly contributes to the amount of milk supplied by farmers. During the dry season, farmers reduce their average yields by a significant amount. This fluctuation is not reliable and also increases the number of milk rejects in the dry period as pathogens multiply faster and other farmers resort to supplying milk with antibacterial residues so as to increase incomes in such periods. During the rainy season as well, Milk quantities rise to levels beyond the contractually agreed upon quantity with Savannah plant. This makes it an unreliable market because milk quantities go beyond or below the plant's capacity.

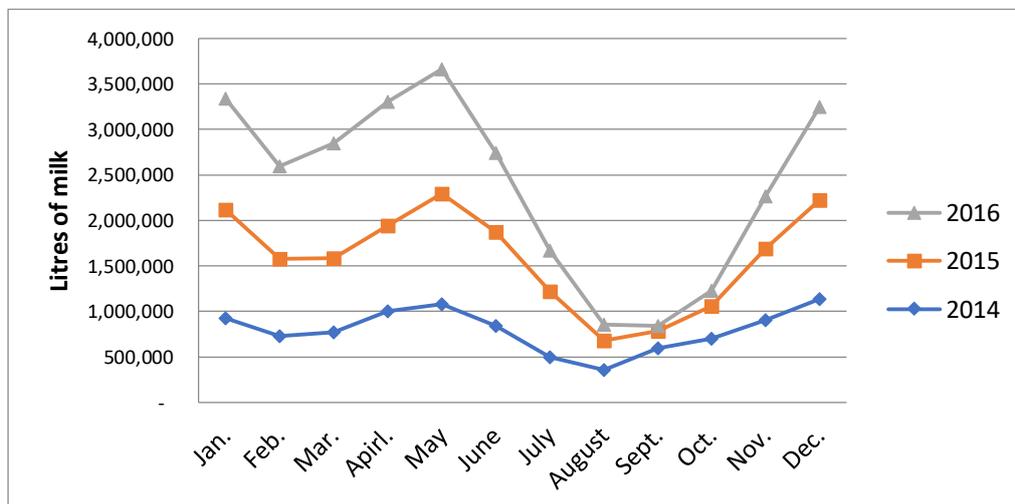


Figure 9: Nyagatare Milk Supply 2014-2015 (Source: Key Informant 16)

6. There is a general lack of awareness among farmers when it comes to good farming practices. These may include in hygiene of cattle udders before milking, hygiene of containers with which they carry the raw milk. According to key Informant 18, some successes have been achieved like the banning of milk being delivered in Jerricans and adulteration levels reducing.

This however contrasted with the supply chain observation tool used as some jerricans were observed at MCP level as seen in figure 10



Figure 10: Milk in Jerricans

7. There is presence of Unskilled personnel in area of dairy management at KAFCO and other Nyagatare District cooperatives whereby certain individuals who hold high places within the management structures are “untouchable” whereby their milk is not rejected at the MCC level because of who they are even if it does not meet quality standards. There is also a need to shift from traditional farming to modern farming by farmers which is a process not one-day achievement.
8. Moreover, there is a drive by a taskforce (Comprised of RAB/Livestock, Inyange, Local Government, Nyagatare Dairy Farmers Union, security authorities and Rwanda Dairy Development Programme) initiated by the Ministry of Agriculture to minimize the milk rejects within Nyagatare district. This taskforce has ensured that since May 22nd 2019, there has been no Milk rejects at the Savannah Bulking station by making sure that all MCCs have cooling equipment, and a technician from Rwanda Dairy Development programme to enhance quality standards.
9. Value share in the current structure: During the Focus group Discussion, farmers expressed dissatisfaction with the current prices of Milk being given by the client company. This was in line with what Key informant 18 pointed out when he mentioned a field study that was carried out by the Ministry of Agriculture that specified that for an average small scale farmer to break-even, the milk price should be set at 230 Rwf. Figure 11 shows the calculations used during Focus group discussion 1 that explain why farmers cannot invest in a feeding additives and other milk quality additions because they already register a 200 Rwf loss per day per cow.

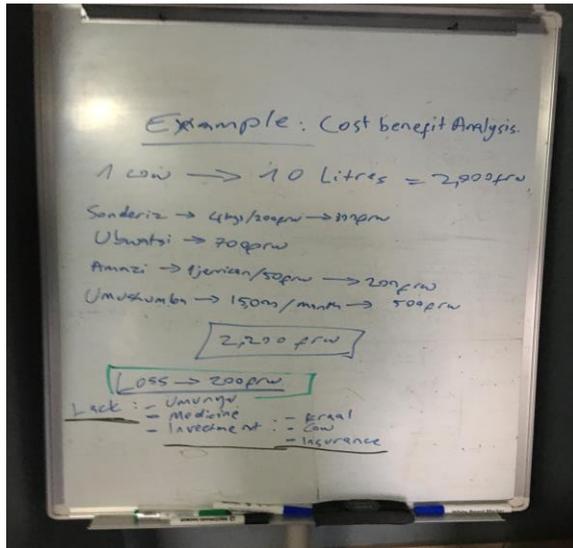


Figure 11: Value share Calculation

Results above can be compiled into a problem tree defines in figure: 11

KAFCO Problem Tree

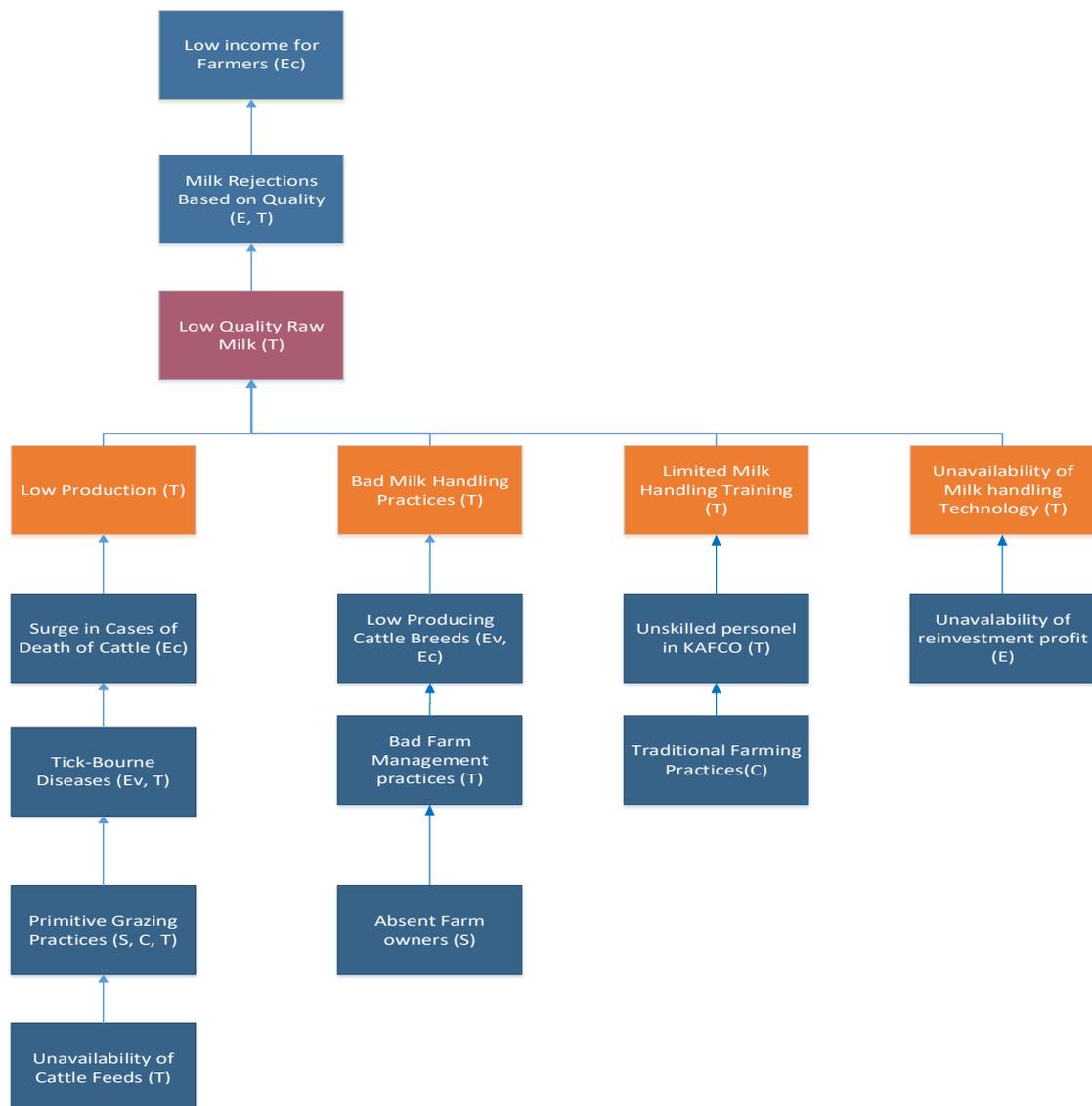


Figure 12: KAFCO Problem tree

6.1.4 Strategies that can be adopted to tackle the quality hindrances faced by KAFCO

Once the hindrances to quality milk procurement were documented, it was time to conduct a focus group discussion with cooperative members to come up with participatory strategies to engender the current value chain.

Focus Group Discussion Results

A focus group discussion was held with 20 randomly selected members of the cooperative to address research questions 1.3 and 1.4.

Hindrances faced in quality milk production.

1. Farmers lack skills to diagnose or prevent the problem of Mastitis in cattle

2. Milk traders do not follow quality requirements as they collect milk from many remote farm locations.
3. Lack of funds to invest in quality upgrades as farmers believe that they are not making any extra profit after taking care of household responsibilities
4. Hygiene of both milkers and milking equipment is below par because most of the farm owners do not monitor the work their herdsmen do
5. Traditional farming methods are a hindrance to the development of the cooperative. It is for this reason that when the

Strategies to tackle quality hindrances

The Farmers agreed on the following strategies

1. They asked the management of the cooperative to advocate for training on:
 - How to verify withdrawal times on medicines
 - Proper hygiene techniques for milk cans, milk filters, and other good farming practices
2. They demand that the cooperative strategize on how to source good acaricides for prevention of tick-borne diseases.
3. They demand that the cooperative management strategize on finding reliable market.

There is need therefore for KAFCO to advocate for a higher price of raw milk in order to increase the incomes of her member farmers. This not only affects milk cooperatives as Key Informant 9 also spoke of a lack of a profitable milk price leading many farmers to resort to changing profession.

Ideal Value Chain Structure

The farmers then designed an ideal value chain structure after understanding the value chain concept as seen in figure 13

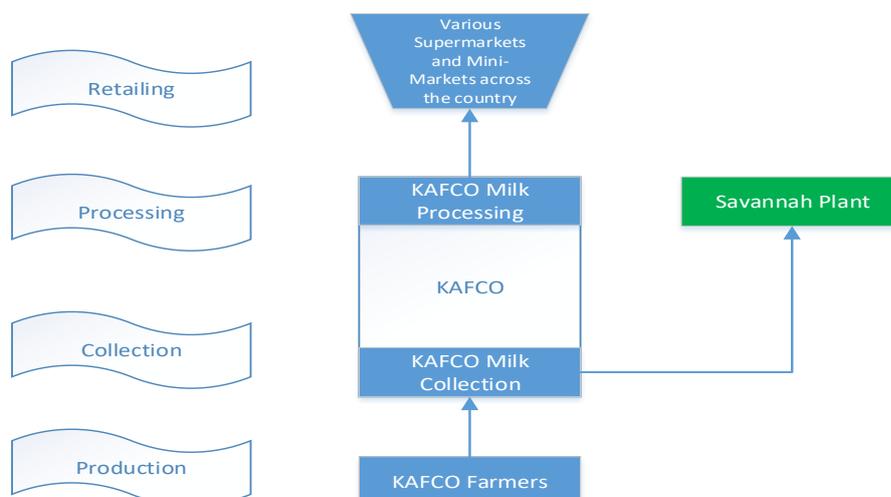


Figure 13: Ideal Value chain Structure

Summary of Strategies to tackle Quality Hindrances.

1. According to Key Informants 2 and 16, currently KAFCO has applied for a grant to build a milk zone with a pasteurizer in order to make create a local selling point of Grade 2 milk that doesn't reach the quality standards of Inyange. By the end of the year, the project will be completed and a quality based payment system implemented for a different grade of milk. This would fall in line with the farmers wishes to find an alternative route for their milk.
2. According to Key Informant 2 KAFCO needs to invest and advocate for the completions of the MCPs building project and the acquisition of Milk testing equipment to facilitate with milk acquired from remote farms in Katabagemu sector. This would tackle the hygiene problem mentioned in section 6.1.3
3. Key informant 4 emphasized that KAFCO needs to plan to start a weekly awareness campaign for farmers to invest in increasing the quality of their milk by providing collateral for farmer loans given by SACCOs and other financial institutions in order to fast track the quality procurement of KAFCO milk. This also works in favour of the FGD wishes laid out by the cooperative members

6.2 Strategies and Opportunities for Milk Processing

Nyagatare District is on the path to engendering the dairy value chain. One of the components of this development is to add value to the products being produced within the district. Research question 2 will provide answers to where there is an opportunity for KAFCO to mainstream this change

6.2.1 Domestic Dairy Products Value chain and Stakeholders Involved

To Map out the Domestic dairy products value chain, I held Interviews with 4 stakeholders.

Milk processing in Nyagatare District

According to Key Informant 17, Rwanda has 5 milk sheds namely: Kigali, Gicumbi, Nyanza, Nyagatare and Gishwati. Of these Milk sheds, Nyagatare produces the most milk but does not have processing functions beyond fermented milk. Inyange Industries has 3 subsidiaries namely: Giheke, Savannah and Mukamira of which Savannah is the only processor in Nyagatare District. This implies the absence of any processors besides Inyange Industries in the Nyagatare District Value chain.

Stakeholders within the processed milk value chain, Rwanda

According to Key Informants 18 and 19, Other Milk processors within the country are: Gishwati Diaries, Masaka Creamery Ltd, Bless Diaries, Ingabo diary, Imena Dairy, Entreprise Urugwiro, Muhe Diaries and Zirakamwa diaries. These processors all operate within the other 4 Milk sheds. The products being processed are UHT Milk, Yoghurts, Gouda cheese, Fermented milk, ghee and butter. The main customers for these products are Supermarkets within Kigali city, Pizzerias and Export to DRC. The stakeholders in the Dairy products value chain do not play any different roles from those operating within the Nyagatare Milk Value chain as they only differ with the addition of numerous processors who double as wholesalers.

6.2.2 Constraints for quality milk product procurement

The same stakeholder interviews asked the key interviewers to mention the constraints they experience with regards to quality milk product procurement.

1. According to Key Informant 21, there is a lack of diversity within the dairy products value chain. It is common that Processors do not cater to high-end niche markets or specialize in exotic dairy products and this contributes to the Import of Many dairy products per year. Key Informant 19 argued that despite the availability of numerous processors, there is still a need to pay attention to the market, because as seen in table 5 there is a continuous deficit in Import-Export data that registered almost 2 million dollars' worth of deficit in just 6 months this year.

Table 5: Import/Export data January-June 2019

Dairy products January-June 2019 import and export				
		Export	Import	Deficit
Formal	Revenues(USD)	2,104,435	5,061,160	
Informal	Revenues(USD)	1,032,856	42,490	
Total Processed milk	Revenues(USD)	3,137,291	5,103,650	(1,966,360)

2. Key Informant 21 went on to say that the performance of certain processors do not certify quality standards and are not willing to cooperate when their products are rejected by the customer for certain quality short comings.

6.2.3 Strategies to Mainstream Milk processing in Nyagatare Dairy value chain

Research question 2.4 deals with defining strategies to mainstream milk processing in Nyagatare District. The following are the results obtained from research interviews with key respondents.

1. According to Key Informant 17, Inyange Industries contract with Nyagatare MCCs is for only 50,000 litres per day. This means that during the high milk yield season when Milk reaches a total of 70,000 litres, the company is stretched beyond it's capacity. During the month of July, on the dates of 12th and 19th, Milk from KAFCO was told not to be delivered because the capacity was overbooked. This registered a loss on the hand of the Cooperative as they had to look for where else to supply these thousands of litres. Figures 14 and 15 show the Milk yield of Kafco during the month of July.

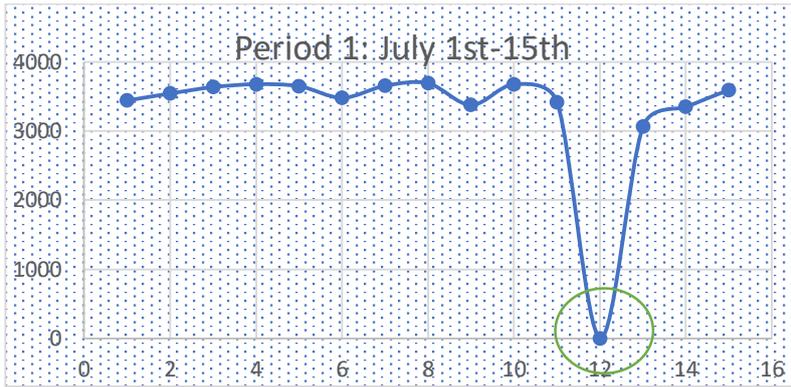


Figure 14: Period 1, July

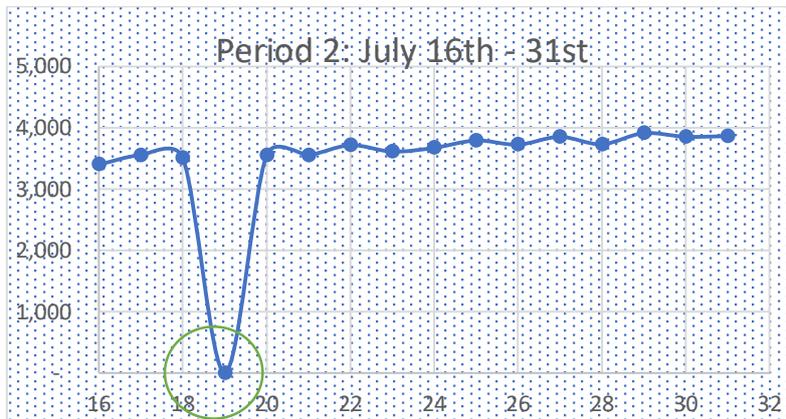


Figure 15: Period 2, July

Provided KAFCO and other MCCs follow opportunities laid out by Key Informant 14 about Rwanda Dairy Development Grants, the MCCs can develop value added products with a longer shelf life and never have to deal with such uncertainties again.

2. There is a current push for made in Rwanda products that puts producers at a great advantage as Key informant 21 Mentions. As the fastest growing and largest retail chain aims to reach 98% local products of the food on their shelves, Nyagatare District should aim to be part of the move and supply products made from her milk.

“KAFCO that is contributing 6% of Nyagatare Districts Milk yield can be a pace setter and show the other cooperatives that there is a demand for Nyagatare Milk products within the domestic and export markets” emphasized Key Informant 12. Figure 16 shows the percentage of KAFCOs contribution in Milk to Nyagatare’s total milk sales in the month of July. Milk is an Integral part of the Nyagatare economy as mentioned by Key Informants 12 and 7, contributing 400 million Rwandan Francs to the Nyagatare economy per month. Therefore, value addition to her primary value chain would vastly ameliorate her growth.

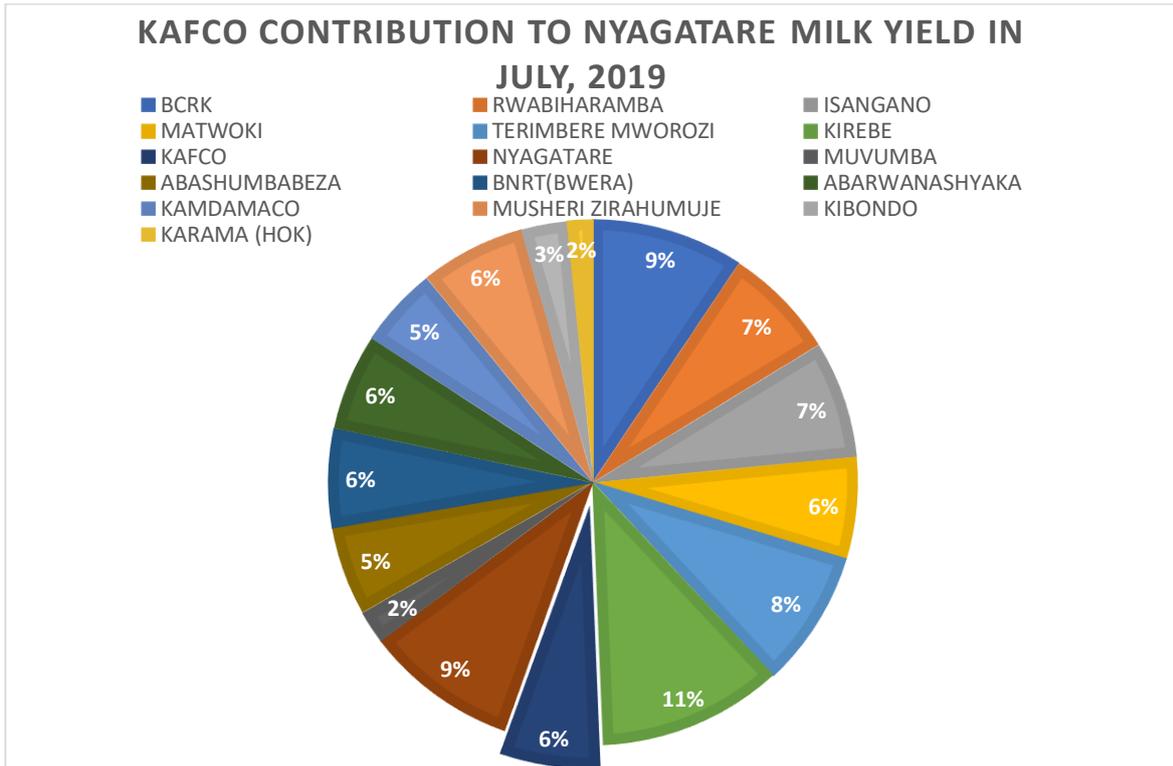


Figure 16: Contribution of KAFCO to Nyagatare Milk Revenues

Chapter 7: Discussion

This chapter is a discussion of my research findings with Literature already reviewed to answer the research questions and a reflection on my role as a researcher and the limitations to my research

7.1 Strategies for Quality Milk Procurement

1. There is an apparent top-down approach with regards to any changes or adjustments that are made to the Dairy value chain in Rwanda. This is seen in the different ways in which the government approaches development schemes. The Taskforce against milk rejects implemented a milk reject dissemination at Savannah Bulking Plant within 5 weeks of being formed and this was very different prior to its formation. It is evident that for the work done to be strategic, there needs to be an incentive mechanism for the private sector to take part rather than lag behind. This falls in line with preliminary quality assurance tests set forth by van den Berg (1990) who describes the basic requirements for an MCC to qualify as a quality standard hub (see section 4.2)

2. There is a current move for the following tests to be administered at MCC level in order to avoid milk rejects at Savannah bulking station although there are still some financial hurdles. Milk being tested at the MCC level does not always go through the following tests as the kits are not always available. There is a need for cooperatives to invest in all the tests mentioned in order to get rid of rejects at the bulking station.

7.2 Strategies and Opportunities for Milk Processing

1. The Government of Rwanda has taken a bold and appreciated step in pushing forward a Task Force to fight Milk Rejects in Nyagatare District. However, the mandate of this Taskforce is only defined by one client in the formal value chain who is not liable for any failures with regard to bulk milk acquisition. Inyanges Contract with MCCs in Nyagatare stipulates only 50,000 litres per day (Badege, et al., 2017) and this is different from what is being pushed by the taskforce. I realised that, as this point was coming across from key respondents in the value chain actor category, enablers did not want to speak on it. This may have also speak to the monopolic power in the captive value chain.

2. Although Farmers were very eager and willing to jump ship and access the processed milk value chain, there is still a skills gap at the production level. According to National Food Security Task Force (2017), The MCCs in Nyagatare District are mismanaged and that some cooperative management seminars should be prerogative in getting any improvements done at MCC level. This was observable during the time in my research I spent a lot of time with the cooperative management. It is evident that if any other Investment is done without prior skills training, the work would yield no efficient results. This falls in line with literature from Makoni et al that listed all value chain actors in the Rwandan value chain although their work was published before the inception of Rwanda Dairy Development Programme.

Reflection on my role as a researcher

1. It was clear while conducting this research that there were some misperceptions as to what role I was there to play was. I believe that I am at a great advantage in that, the community and cooperative for which I did my case study was very welcoming of me as one of their own. This however came with its own consequence of expectations by the cooperative. I had to clearly state that the information I was looking for was strictly for research purposes and that my presence was not a cause for them to be optimistic about a sudden change I would initiate thereafter. This may have shifted the quality of

my results as the respondents clearly intended to shift my results in a different direction from the truth.

2. When I used the supply chain observation tool, it was clear that the cooperative leadership was not happy as an eye here and there would tell me that what I am doing is not welcome. It was perceived as though I was there to police them when in actual fact, I was just collecting data. The same could be said for policy makers who refused me to take recordings of our research even through I had assured them of confidentiality

Limitations to Research

1. Having not seen any other research on this topic before, I doubt myself on how I appropriated the tools for research as this was my first time conducting it.

2. I believe that not having hired a research assistant limited the results I was getting to my biased perception as mentioned before

3. There is a barrier in the free flow of information when it comes to the developmental topics in Rwanda and so I have to overthink whether a respondent is telling the truth or not.

Chapter 8: Conclusion

The study was conducted to find out the possibility of reducing Milk rejects by increasing quality milk procurement at MCC level in Nyagatare district. The study went on to examine the potential for Milk processing at MCC level in order to venture into value addition in Nyagatare district. The following conclusions presented in this chapter were derived from analysed data of the interviews, observations, secondary data and Focus Group Discussions.

A taskforce initiated by the Ministry of Agriculture during the month of May 2019 has made tremendous strides in ensuring that milk rejects are minimised completely in the Nyagatare dairy value chain. This has registered many wins as it has gone hand in hand with the proper implementation of Rwanda Dairy development programme that has managed to create major changes with regards to financing value chain actors.

There is an eminent need for Nyagatare District to try and penetrate the macro-economic demand for import substitution products especially within the Dairy value chain as this is her greatest asset. MCCs being a hub for a significant amount of power within the value chain can be pioneers in this move leading to a bottom up development strategy which is in line with the country's vision.

The findings revealed that the biggest contributor to milk quality rejects was hygiene at the farmer level. A supply chain observation tool also revealed that the absence of a cold chain contributed to milk rejects as well. It characterized the current business model of dairy cooperatives to be captive after analysis. The findings on the processing market front indicated a dire need for Nyagatare District MCCs to mainstream processing in the sector in order to bridge the Import/export gap being realized on the processed milk value chain. The mechanisms present for upgrading value chains into processing were highlighted by this research.

Chapter 9: Applied Recommendations

This chapter proposes strategies for improving quality of Milk procured at Milk Collection Centre Level in Nyagatare District of Rwanda and Strategies to penetrate the existing processed milk value chain in Kigali City.

Producers/Small Scale Farmers that supply to KAFCO

1. KAFCO should develop a catalog of milk rejects per cooperative member and create quality milk awareness campaigns on best farming Practices that are geared to tackle the worst performers in the cooperative.
2. There should be an inclusive model developed by cooperative members along with their leadership on which measures to take on producers that do not comply with agreed upon mechanisms. With the assistance of Local government, this should be implemented right away as the task force formed against Milk rejects is active.
3. KAFCO is advised to put all the delivering milk tradesmen into associations where they can be traceable and provided the training they need in terms of milk quality procurement before the end of the year
4. KAFCO needs to source and contract places veterinary services that provide up-to-date acaricides with certifications as soon as possible.

Milk Rejects Task Force

1. The Milk Rejects Task Force initiated by the Ministry of Agriculture needs to do a study on the Macro Economic Impacts of Nyagatare Dairy Value chain; The absence of Nyagatare District in the processed milk value chain is of a big loss to the Import/Export Deficit. This taskforce should conduct a stakeholder meeting before the end of the year to analyse the missing link to Kigali's Market by MCCs. This should end in an action plan that can help in Nyagatares MCCs penetrating the Processed Milk Value chain.
2. The task force should carry out a study on sustainability the sustainability of the already implemented changes to the dairy value chain in Nyagatare District.

KAFCO Management

1. The Management of KAFCO needs to fast track the process of acquiring an alternative outlet for their surplus milk. This is a long term recommendation and the cooperative management convene a stakeholder meeting to develop an Action plan. This can be done in 2 ways:
 - KAFCO should begin the process of applying for RDDP grants to get a storage tank for excess milk that will be sold in the sector by way of a milk zone no later than 2019 Season A.
 - KAFCO can as well request funding from RDDP to acquire a milk processing unit for a dairy product of their choice and partner with a retail store in Kigali, preferably SIMBA Supermarket that has shown interest in Eastern province ventures.

Table... Shows this alternative Business Model

Table 6: Ideal Business Canvas Model

<u>Key Partners</u>	<u>Key Activities</u>	<u>Value proposition</u>	<u>Customer Relation</u>	<u>Customer segment</u>
<ul style="list-style-type: none"> ❖ Heifer International ❖ Land O'Lakes International ❖ RYAF ❖ RAB ❖ Inyange Industries ❖ RALIS ❖ Bank of Kigali ❖ Kigali Retail Stores 	<ul style="list-style-type: none"> ❖ Selling of Raw Milk ❖ Provision of transportation services ❖ Provision of Veterinary services ❖ Provision of Cattle feed supplements ❖ Pasteurising od lower grade milk for sale at Milk Kiosks ❖ Processing of Milk into Milk Products 	<ul style="list-style-type: none"> ❖ <i>Provision of high quality raw milk in order to create wealth for cooperative member farmers</i> ❖ <i>Provision of good Milk delivery services for other MCCs</i> ❖ <i>Provision of high quality veterinary services for member farmers and cattle feed supplements</i> ❖ Pasteurized milk and milk products 	<ul style="list-style-type: none"> ❖ Transportation of Raw Milk from MCC to Savannah plant done by KAFCO Truck ❖ Telephone communication of Truck bookings ❖ Veterinary/Feed Supplement services paid in Milk supplied ❖ Retail outlet deliveries 	<ul style="list-style-type: none"> ❖ Inyange Industries, Savannah Plant ❖ Musenyi Sector Dairy cooperative (Abarwanashyaka) ❖ KAFCO Member farmers ❖ Retail Stores ❖ Milk zone clients
	<p><u>Key resource</u></p> <ul style="list-style-type: none"> ❖ Transportation Tracks ❖ Milk Cans ❖ Storage Facilities ❖ Coolers ❖ Generator ❖ MCC Office HQs with MCC Hub Requirements ❖ Skilled Employees ❖ Pasteurizer 		<p><u>Channels</u></p> <ul style="list-style-type: none"> ❖ On-site sales ❖ Telephone communication Veterinary Services and Truck Booking ❖ Transportation trucks ❖ Retail Store orders 	

	❖ Milk Processor	
<p><u>Cost structure</u></p> <ul style="list-style-type: none"> ❖ Employee Wages ❖ Fuel Costs and Maintenance Costs for generator ❖ Cost price of Veterinary Medicines and Feed Supplements ❖ Loan repayments for past credits ❖ Input cost for processing 		<p><u>Revenue Stream</u></p> <ul style="list-style-type: none"> ❖ Truck Rental Services ❖ Veterinary Services ❖ Raw Milk Supplied value share ❖ Milk Products delivered Value share

2. The Management of KAFCO needs to invest in the skills gap identified by staff with regards to quality testing of milk by partnering with Inyange Quality department by end of year 2019.

3. The Management of KAFCO needs to invest in becoming a hub model MCC by end of year 2019 by adding to the services they provide; Artificial Insemination, and a Laboratory to carry out Antibiotic and somatic cell count test at the MCC.

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Annexes

Annex 1: Research Tool Checklists

Interview Checklists

Cooperative Management Interviews - Key informants

1. Background on involvement in dairy sector
2. Office Information and Background
3. Management structure
4. Dairy Value chain KAFCO
5. Products and trends
6. Background on Quality requirements
7. Dairy cooperatives: Background and Quality Hindrances
8. Partners/stakeholders and their roles in dairy chain development
9. Quality related policies and implementation in the Rwanda
10. Challenges of Dairy Sector in Rwanda
11. Way forward for Dairy sector in Katabagemu

Expert views - Key informants

NameLocation.....

1. Background on involvement in dairy sector
2. Dairy Processing Information and Background
3. Dairy cooperatives, Dairy products and trends
4. Partners/stakeholders and their roles in dairy chain development
5. Quality related policies and implementation in the Rwanda
6. Challenges of Dairy Sector in Rwanda
7. Way forward for Dairy sector.

Financial support institutions

NameLocation.....

1. Types of agricultural activities supported (crop, livestock, food forest, agribusiness, etc.)
2. Bank/Insurance policy to support agricultural sector
3. Financial/Insurance support for dairy sector
4. Type of products provided to farmers
5. Requirements for loan
6. Trend of agricultural loan repayment
7. Other agribusinesses supported
8. Challenges with agricultural financing
9. The way forward

District/Province Leadership

NameLocation.....

1. Dairy sector background and importance to development

2. Details of Dairy value chain.
3. Policies on dairy sector development (especially for cooperatives)
4. Extend to which the Dairy development strategy has reached in implementation
5. The community perception about the Government support
6. Dairy initiatives on processing/Quality that are being supported
7. Land tenure system of the municipality to support dairy farming
8. Budget allocation for dairy improvement

Milk Processors

NameLocation.....

1. What kind of products do you process?
2. How do you get the Milk? (Value chain)
3. Where do you sell the products?
4. How much is the input price?
5. How much is the selling price? (per product)
6. What is customers' preference on dairy products?
7. What is your requirement for your suppliers? (volume, quality, price, etc.)
8. What are the quality standards in place for your processing?
9. Are there government regulations for dairy processors?
10. Are there government initiatives towards dairy processing that you have benefited from? (subsidy, grant, loan, etc.)
11. What are the challenges of processing dairy products?
12. What is your vision in 5 years in relation with dairy processing and your demand prediction?

Retailers and Institutional consumers

NameLocation.....

1. Background and Number of years in business
2. Source your dairy products
3. Percentage composition of dairy products in your shop
4. The demand for dairy products by the consumers
5. Quality requirements for products
6. Frequency of supply of dairy products to your shop
7. Your reasons for selling dairy products
8. The challenges of retailing dairy products
9. Main origin of consumption of dairy products and trend

Focus Group Discussion Checklist

1. Explanation of the Value chain concept
2. Calculation of Value share within the current value chain
3. What are the hindrances faced in Dairy farming with regards to quality milk production?
4. What strategies can be adopted to create solutions to these quality related problems?

5. What does an ideal value chain look like for you?

KAFCO Milk Supply Chain checklist

1. What is the Supply Chain Structure of KAFCO?
2. What are the Distances, Times, and Schedules at various points of the KAFCO supply chain?
3. What are the quality requirements at various points in the Supply chain?
4. What are the different Milk quality assurance tests done throughout the supply chain?
5. What are the contamination points in the supply chain?

Business Canvas Checklist

Key partners

1. Who are your input suppliers?
2. Who are your important key partners?
3. What support do you get from your key partners?
4. What activities do your partners perform?

Key resources

1. What is your current balance sheet?
2. How much milk do you buy collect and sell?
3. What other physical infrastructures do you have apart from land?
4. How many members do you have (Males and females)?

Key activities

1. What Milk production activities do you perform?
2. Where other businesses do you have?

Channels

1. Where do you sell your Milk?
2. How do you communicate your customers?
3. How do you reach your customers?

Customers segments

1. How many Services do you offer?
2. What are your customer segments?

3. Who has the most power among your customer segments?

Customer's relationships

1. Do you have contract with your customers?

2. Do you have any training or workshops for your customers?

Value proposition

1. What product do you offer your customers?

2. How do you deliver your product?

3. What distinguishes you from your competitors?

Cost structure

1. What are the average Milk collection costs incurred?

2. What are the monthly sales made by the cooperative?

Revenue streams

1. What is the price per litre?

2. What other services apart from milk collection do you offer and at what price?

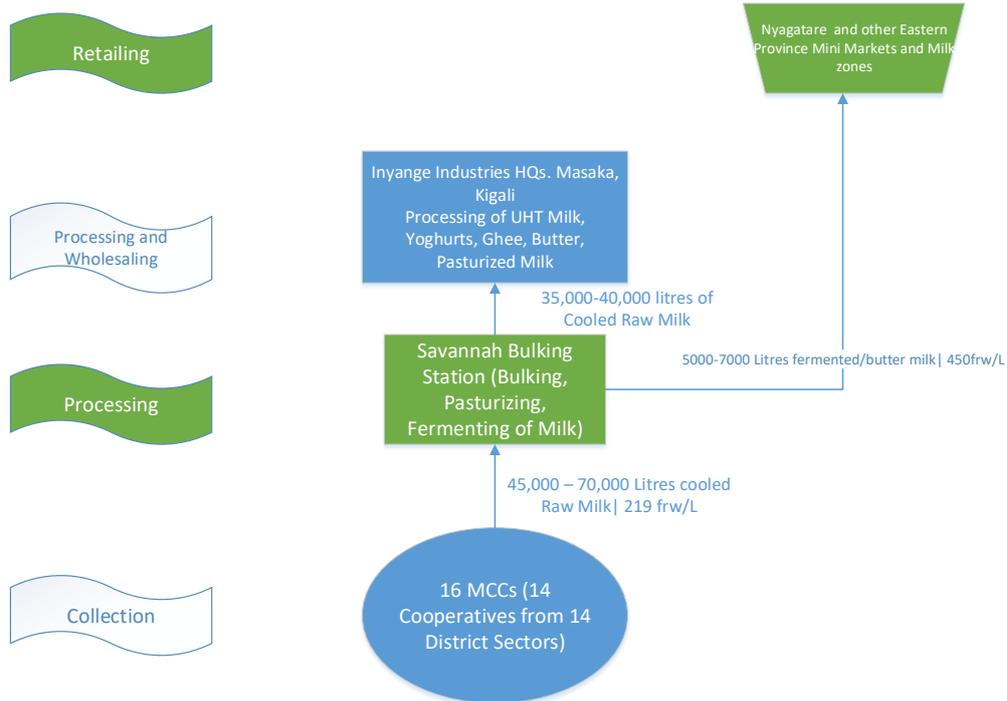
Sustainability – Gender

1. How are the management roles mainly divided with regards to gender?

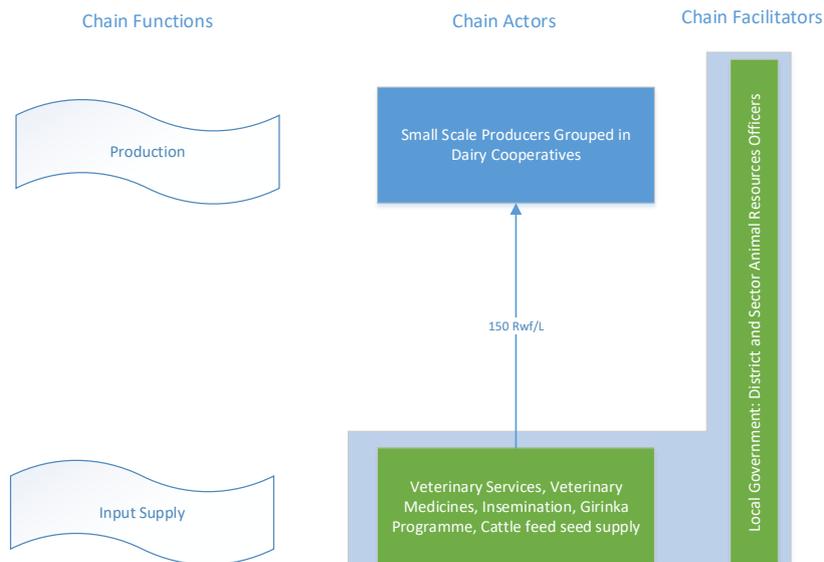
2. Do men and women have equal voice with regards to decision making in the cooperative?

Annex 2: Value Chain Maps: Stakeholder Interviews

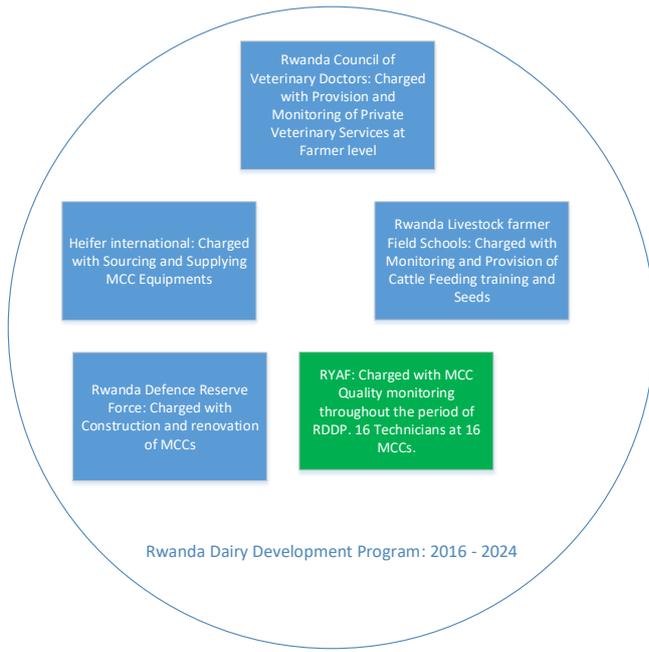
Savannah Bulking Station and role within the Value chain



Local Government Value chain map



Rwanda Dairy Development Programme Implementers 2019



Annex 3: Current compiled Dairy Value Chain Map of Nyagatare District

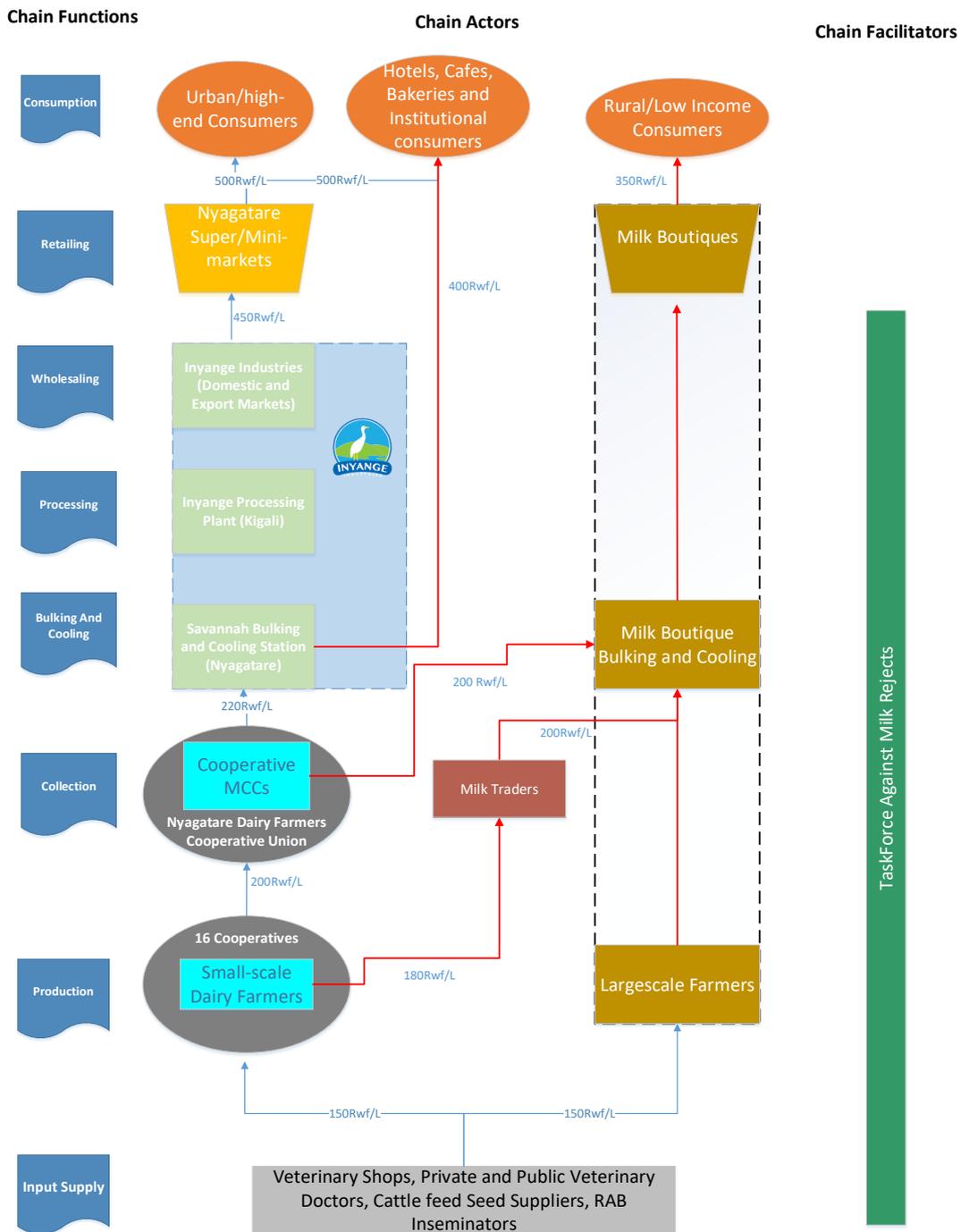


Figure 17: Nyagatare Value Dairy Value Chain Map

In figure 2.2.1, illustrate product and information flow with a significant emphasis put on the Formal and Informal chain. Blue arrows indicate the formal product flow while Red arrows show the informal product flow.

Annex 4: Stakeholder Matrix Instructions

Quadrant A: High Interest/Low influence

These are stakeholders who should be **shown consideration** when making any changes to the dairy value chain in Nyagatare. We should make use of interest through involvement in low risk areas, keep them informed and consult on interest area, remember that they are potential goodwill ambassadors and supporters (Stakeholdermap.com, 2014)

Quadrant B: High Interest/High Influence

These stakeholders are **Key players** and should be involved in all the value chain approaches that we aim to take. One should focus efforts on this group, involve them in decision-making bodies and governance, and engage and consult regularly. (Stakeholdermap.com, 2014)

Quadrant C: Low Interest/Low Influence

These stakeholders are **least important** to consider when applying and value chain changes. This quadrant can be informed via general communications of progress and one should aim to pick their interest. (Stakeholdermap.com, 2014)

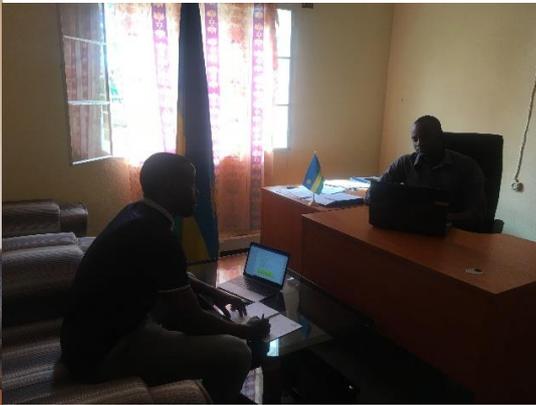
Quadrant D: Low Interest/High Influence

These stakeholders are grouped as those whose **needs should be met** when making any value chain considerations. One should aim to gauge this group's interest. (Stakeholdermap.com, 2014)

Annex 5: Pictures from Field Study

Interview Pictures





Supply Chain Observation Pictures

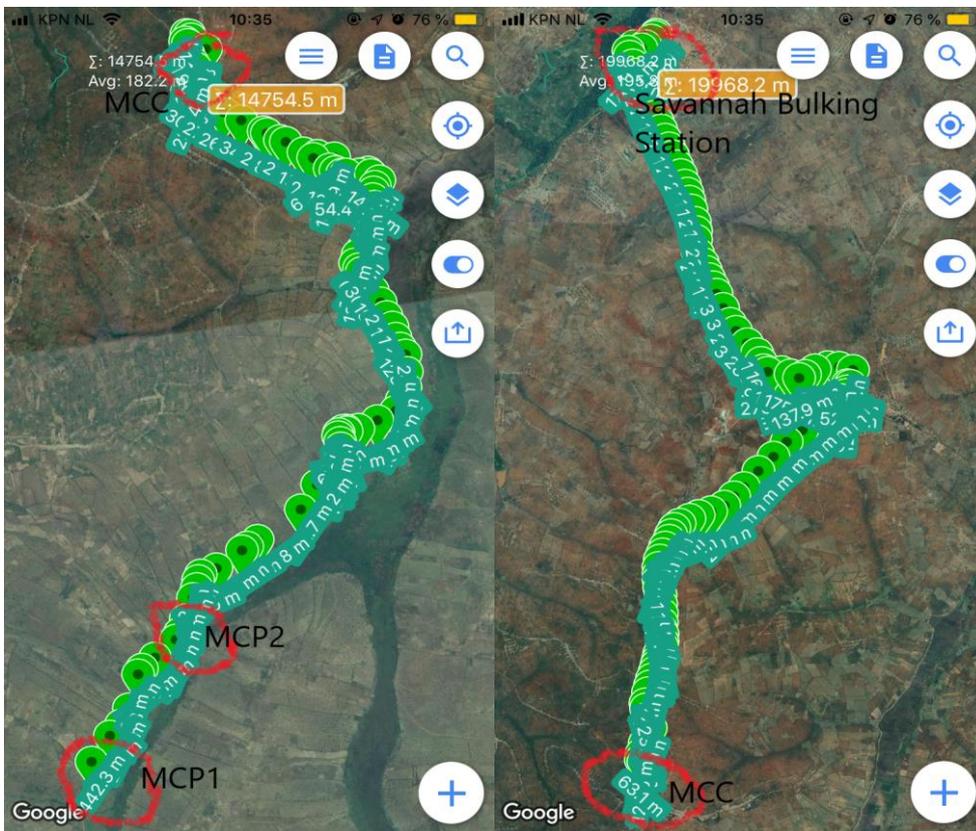
Milk Collection Point Activities



Milk Collection Centre Activities



Transportation and Bulking station Activities



Annex 6: Key Informant Interviews

Code	Name of Interviewee	Occupation	Organization	Contact Number
01	Rwema James	Quality Analyst	Savannah Bulking Station	+250788902615
02	Mugemana Johnson	Cooperative Manager	Katabagemu Dairy Farmers Cooperative	+250788795776
03	Karibwende Emmanuel	Sector Animal Resources Officer	Katabagemu Administrative Sector	+250789431376
04	Kutesa Emmanuel	Veterinary Doctor	Rwanda Youth in Agriculture Forum/Rwanda council of Veterinary Doctors	+250782863161
05	Mugabo John	Union Manager	Nyagatare Dairy Farmers Union	+250788639330
06	Niyonshuti Fabien	Nyagatare District Head Veterinarian	Nyagatare District Administration	+250788692978
07	Rutayisire Gilbert	Director of Agriculture	Nyagatare District Administration	+250788475592
08	Masumbuku Fred	Head of Milk traders association	Terimbere Mucunda Ass.	+250780412077
09	Gafuruka	Largescale Farmer		+250788304824
10	Butirimba Faustin	Accountant	SACCO - Karangazi	+250788518326
11	Kagwa Evarde	Station Manager- Nyagatare	Rwanda Agriculture and Animal Resources Board	+250788727649
12	Rurangwa Stephen	Task force against Milk Rejects Manager	Vice Mayor in Charge of Economics	+250788855758
13	Rukema Emmy	Cooperatives Director	Nyagatare District Administration	+250783840064
14	Rugamba Maurice	Station Manager - Nyagatare	Rwanda Dairy Development Programme	+250788447965
15	Mukakazana Catherine	Farmer	KAFCO	+250788598159
16	Mukamutara Annette	Farmer	Board of Directors - Kafco	

17	Bucakara David	Head of Milk supply chain	Inyange Industries	+250788306790
18	Rutagwenda Theogene	Director General of Animal Resources Development	Ministry of Agriculture	+250788303309
19	Shema Aimable	Animal Value Chain Specialist	Consultant	+250788758226
20	Munyaneza Jean Marie Vianey	Emerging Value chains Division Manager	NAEB	+250785700459
21	Samuel Teame	Branch Manager	Simba Supermarket	+250784686026
22	Emmanuel Kageruka	Manager	Gishwati Farms Ltd	+250788465258