THE EFFECTIVENESS OF LOGISTICS IN THE DAIRY FARMING VALUE CHAIN IN ZIMBABWE: THE CASE OF DAIRY FARMS IN MASHONALAND EAST PROVINCE

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DEDICATION

A special dedication goes to my family, colleagues and friends who encouraged me to meditate and comprehend. I earnestly feel that without their inspiration, able guidance and commitment I would not be able to navigate through the strenuous process of this research study.
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ABSTRACT

The motivation of this research project was to explore and draw deductions on the effectiveness of logistics in the dairy farming value chain of farmers located in Mashonaland East. The general conclusion from literature is that logistics is being used as a tool in agribusiness value chain to reduce their chain cost and more importantly to improve their business efficiency as a whole. Dairy logistics is growing at a swift rate throughout the world because farm enterprises view it as a way to attain quality milk, enhance profitability and provide effective services to customers. However, this literature has been limited to other parts of the world and not Zimbabwe; hence the aim of the study was to try to fill this research gap by critically assessing logistics in the dairy farming value chain in Zimbabwe. The research information and its applications were aimed at benefiting the dairy industry and the academic community.

The study was based on a single case research study design of dairy farmers located in Mashonaland East province. Questionnaires were distributed to dairy farmers that had been purposefully selected to permit the gathering of in-depth information using a semi-structured questionnaire. The research philosophy employed was qualitative and the gathered data was analysed through Data Displays in the form of Content Analytic summary tables.

The study established that the road infrastructure in Mashonaland East has negative impact on the efficiency of inbound and outbound logistics. It was also found that the effectiveness of logistics in dairy farming is compromised by the small size of orders to suppliers, scarcity of fuel, poor condition of milk collection trucks, low quantity levels of milk delivered to processors and the high cost of hiring third party transporters. The research overall concluded that the inbound and outbound logistics in dairy farming sector in the province is not effective because of poor road infrastructure.

In consideration of these findings, it is recommended that the dairy farmers must form cooperative societies for effective collection of milk and bulk purchasing; and set up logistics information systems to save time. At policy level, the Government should revise the current policies in the dairy industry so that they cater for small enterprises.
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CHAPTER 1: INTRODUCTION AND BACKGROUND OF STUDY

1.1 Introduction

Logistics is an integral part of every economy and every business entity. The earliest acknowledged illustration of scholarly writing on logistics (in 1901) is actually located in agribusiness (Stock and Lambert, 2001: p11). In agribusiness, the management and improvement of logistics is one of the most significant task since they are constantly facing immense pressure from customers to decrease costs while at the same time improving efficiency and the effectiveness of their operations (Kujawa, 2003).

In dairy farming, the distribution and collection of milk is one of the problems that brings concern for dairy farmers, especially when considering transportation. In the past, most perishable products had to be consumed around the area where the company was situated due to lack of transportation facilities (Huttner, 2005). But recently with progression in transportation, there is now a possibility of reaching many areas around the world (Heap Kiersten and Food, 1998).

The main aim of logistics for dairy products is to support a high standard of qualified, fresh products with a limited shelf-life (Marais and Meyer, 2005: p26). Milk is a highly perishable product which must be processed within a couple of hours after production or should be stored at low temperatures for 2 or 3 days before processing. Thus, it is essential for milk to have an effective logistics strategy which takes into account the specific attributes of milk which are short sell-by-date, implementation of immediate primary processing (cooling), production volume cannot be increased or reduced and transportation cost should be minimum (Ruben, 2006).

The daily transportation of dairy products is one way to keep food fresh and it is critical for the time that is spent between collections and selling to be short enough, or else it may result in the occurrence of quality problems. The quality problems include the possibility for fat and proteins in the milk’s breaking down after 48-72 hours which will result in bacteria multiplication below certain temperatures (Urraburu, 2000). Thus, the dairy producers and
retailers are in dire need of logistics companies that will care about the special needs and problems in their working environment (Gözegir, Ertek and Büyüközkan, 2008).

However, according to Rokicki (2015), “the agribusiness enterprise is still unexplored in terms of logistics solutions, including the solutions related to information systems” (Rokicki, 2015: p148). There are only a few detailed studies on management logistics in agribusiness enterprises. In light of the above mentioned literature, the available literature has a weakness because it does not address the prime research objectives cited below hence this investigation is aimed at filling this gap by assessing the effectiveness of logistics in the dairy farming value chain in Zimbabwe.

The rest of chapter one will cover the Background to the Case Study, that is Zimbabwe dairy industry analysis, background to the case logistics in dairy farming, problem statement, prime and secondary objectives, research questions, research proposition, significance of the study, the structure of the research and conclusion.

1.2 Background to the study

1.2.1 Dairy Industry Analysis

The dairy subsector is governed by the Dairy Act of Zimbabwe 1977 (ZDIT, 2017). The industry consists of a number of actors from input suppliers, milk producers, processors and transporters to service providers. Producers are clustered into large scale and smallholder with a medium category made up of small scale commercial farmers (Marecha, 2009).

The Dairy Industry in Zimbabwe plays an important role in the country’s agricultural sector, providing the nation with nutrition, while concurrently creating employment and earning the country much-needed foreign currency. The sector has evolved over the years, gradually transforming itself through the implementation of a Government-driven land reform program, which commenced in the late 1990s (ZDIT, 2017).

The dairy production systems range from extensive, low cost systems to intensive, zero-grazing (cut-and-carry) systems (ZDIT, 2017). The country has a milk drinking culture, which somehow took a blow when production levels reduced during the harsh economic environment.
According to the records from the Zimbabwe Dairy Services, the country has processing capacity in excess of 400 million litres and is currently operating at about 40% capacity utilisation (ZDIT, 2017). Therefore, milk production and consumption estimated demand is 120 million litres per annum, and the current supply is just over 50 million litres. The rest is imported (Shara, 2018).

The Zimbabwean dairy industry has been declining for the last decade. Production, processing and marketing costs are constantly increasing when volumes are declining which results in milk and dairy products becoming expensive as high production costs are passed on to the consumer. Therefore, there is a decrease in consumption of milk and dairy products as they become unavailable or too expensive. Thus, local dairy products fail to compete with foreign products, which may result in cheaper imports replacing local products (Marecha, 2009). The table below shows the comparative raw milk prices in Southern and East Africa:

<table>
<thead>
<tr>
<th>Country</th>
<th>Average Price (US$/Litre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zimbabwe</td>
<td>0.60</td>
</tr>
<tr>
<td>South Africa</td>
<td>0.40</td>
</tr>
<tr>
<td>Malawi</td>
<td>0.41</td>
</tr>
<tr>
<td>Zambia</td>
<td>0.35</td>
</tr>
<tr>
<td>Mozambique</td>
<td>0.31</td>
</tr>
<tr>
<td>Uganda</td>
<td>0.26</td>
</tr>
<tr>
<td>Kenya</td>
<td>0.27</td>
</tr>
</tbody>
</table>

Table 1.1- Comparative raw milk prices in Southern and East Africa, Source ZDIT (2017)

From the above table, there is evidence that Zimbabwe has the highest milk price and there is need for effective strategies to reduce the production costs. The challenges being faced by farmers and processors in the dairy industry can be subdivided into productivity factors, animal health factors and marketing factors.

The productivity factors include erratic electricity supply increasing the farm production costs – milking, milk storage (increased losses from spoilage), pasture irrigation, high production and compliance costs (stock feeds, electricity, drugs, EMA fees), poor access to production resources due to bad road infrastructure and lack of available water due to low rainfall/erratic/drought.

The animal health factors include unfavourable cattle disease environment which negatively impacts competitiveness, productivity and poor access to reasonable priced pure breed and
cross breed dairy heifers and cows. Lastly, the marketing factors non-competitiveness of locally produced milk and milk products relative to imported products, inefficient management of small-scale milk collection centres and erratic power supply which increases costs of processing as well as shift consumer preference away from fresh milk which easily spoils if cold chain is broken (ZDIT, 2017).

Lastly, the dairy industry is making efforts to resuscitate the dairy industry through a “Think Milk Drink Milk” campaign which is being spearheaded by the Zimbabwe Dairy Industry Trust (ZDIT) (ZDIT, 2017). Also, the government is in the process of implementing a dairy revitalisation program and has partners under the Private Public Partnerships (Mapakame, 2016). The dairy revitalisation programme is anticipated to reduce the level of imports by the year 2022 (Shara, 2018).

1.2.2 Zimbabwe dairy farming value chain

Dairy farming is a class of agriculture for a business that produces milk, which is processed (either on the farm or at a dairy plant) for eventual sale of a dairy product (Collins, 2019). The dairy farming value chain in Zimbabwe includes both the formal and informal market. Figure 1 on the next page illustrates the Zimbabwe dairy value chain:
Figure 1.1 - Zimbabwe Dairy Farming Value Chain, Source: DSU (2017)
Chain Actors

a) Agriculture input suppliers

Dairy farmers in Zimbabwe require numerous agriculture and veterinary inputs to sustain the livelihood, health and daily production of milk from their herds. The inputs that they require range from stock feeds to veterinary medicines. Most of the reputable veterinary pharmaceutical suppliers that offer a wide range of medicines to dairy farmers such as dips, anthelmintic and vaccines at competitive prices are located in major towns and cities (Matekenya, 2016). Therefore, due to the concentration of input suppliers in major towns and cities, there is great need for an effective inbound logistics system.

b) Dairy Farmers/Producers

The dairy farmers can be subdivided into large and small scale farmers. The large scale farmers are the producers of the chain and own fairly large farms with high producing (> 5000 kg/lactation) pure exotic cows. The producers are segmented into two, some producers send their milk to processors and other producers have a vertical integrated role of being processors on farm and directly retail their milk products to supermarkets and shops. Each farm has a herd size of 50-200 milking cows (Mandiwanza, 2007). It is also important to note that the bulk of the milking in this country still comes from large scale commercial farmers who account for 98% of the milk produced and marketed in the formal local market (ZDIT, 2017).

The small scale farmers are approximately 4,000 smallholder farmers (communal and resettled) who are now engaged in dairy farming and these hold an estimated 3,000 dairy cows and produce 1.5 million litres per annum. Milk processing in the smallholder sector is rather limited and the processed products are either sold locally or sent to urban areas for sale. However, farmers prefer selling their milk directly to consumers or milk vendors because they are paid promptly and the prices are usually higher than those offered at the milk collection centre. Estimates show that out of the total milk produced from this sector 5 to 10% enters the commercial market the rest is disposed of through direct sales to consumers, usually through milk vendors (ZDIT, 2017).

c) Logistics of milk

After milking, the raw milk is chilled and stored at 4°C (Gözegir, Ertek and Büyükozkan, 2008). Raw milk from the dairy farms is sent directly to a processor through a structured farmer’s cooperative transport system, National dairy co-operative (NDC) or the individual farmers deliver
at milk collection centres. The transporter collects and transports bulk raw milk to the processing plant in refrigerated bulk tank trucks. Bulk transporters can be viewed as supporters of the chain as they do not own/purchase the commodity. The co-operative also supplies and services refrigerated bulk tanks on farms thus ensuring that the quality of milk is maintained. Farmers pay monthly rentals of rented bulk tanks and rentals vary with the size of the tanks at the farm. Transport is charged at a rate of US$1/km distance from the processor and the final charge includes the two-way distance (Matekenya, 2016). Figure 2 below summarises the logistics of milk in Zimbabwe:

![Diagram of milk logistics in Zimbabwe](image)

**Figure1.2- Logistics of Milk in Zimbabwe, Source (author’s creation)**

d) **Processing plants**

There are three major processing companies located in Harare namely Dairiboard Zimbabwe Private Limited (DZPL), Kefalos, and Nestle Zimbabwe which process the bulk of milk coming from Mashonaland East province. In the Midlands province, Dendairy (Pvt) company has taken
a huge market share, and only approximately 39% of the milk intake is processed by DZPL with 7% going to Nestle in terms of market share (Borland and Moyo, 1996). Thus, there is importance of logistics management in Zimbabwe since the processors are not widely distributed.

However, the value of raw milk is added by being processed into various milk products such as yoghurts, cheese, pasteurised milk and ice cream. According to Mandiwanza (2007), he stated that the processors are operating at less than 30 percent of installed capacity due to low milk production (Mandiwanza, 2017).

Therefore, the low volume of milk from the farms and huge expenditures from the processors has resulted in high unit costs which results in costly local dairy products as compared to neighbouring markets like South Africa which is evidenced by the influx of imported dairy products to fill this gap.

e) Retailers

Retailing of processed milk and milk products is usually through the formal markets of supermarkets and shops in cities and towns around the country. The processing companies are also involved in formal retailing by employing street salesman with refrigerated bicycle carts who directly sell milk products (i.e. pasteurised milk, yoghurts and ice cream) in the streets and residential areas.

f) Consumers

There is no clear distinction or segmentation in the consumers. Generally, milk products are accessible to the entire general population of the country irrespective of income.

g) Chain supporters

Chain supporters are those stakeholders in the value chain who do not own the product but provide support for the actors and ensure that safe products reach the consumer. The supporters in the Zimbabwe dairy value chain in Zimbabwe are:

- Dairy Services which is a Government Regulatory Department that regulates the functioning of dairy farms. This department offers operating licenses to dairy farms after inspecting the properties and compliance with international regulations of Good Agricultural Practices (GAP).
• The Department of Veterinary services- provides the technical support for the treatment and control of animal diseases through its two departments field services and laboratory services. However, all individual treatments of dairy animals and herds excluding scheduled diseases are carried out by private veterinarians.

• Henderson Research Institute, is a livestock research Institute in the Department of Research and Specialists Services (DR&SS) provides research in dairy nutrition and breeding as well as offering advisory services to both large and small holder dairy farmers.

• Extension services are offered mainly by Government Institutions such as Livestock Production & Development (LPD), AGRITEX and Non-Governmental Organisations. The extension services have declined due to inadequate resources to reach out to the farmers.

• Farmer unions such as Commercial Farmers Union (CFU), Zimbabwe Farmers Union (ZFU) and the Zimbabwe Association of Dairy Farmers (ZADF) which is made up of dairy farmers. These farmers’ organisations network with other stakeholders in the dairy value chain and they play a major role in influencing policy on research, pricing, extension, logistics, marketing and financing in the dairy industry (SNV,2012).

1.2.3 Transport system in Zimbabwe

Zimbabwe’s road network is comprised of around 88,300 kilometres of road network including 15,000km paved (AFDB, 2011). The road network is divided into primary, secondary, tertiary feeder access road and urban roads. Primary roads consist of 5% of the network and they link the country to its neighbouring countries. Thus, they are important for imports and export of goods (Curtis, 2009). AFDB (2011) highlights that the changes in road conditions in Zimbabwe were estimated to have declined from 73% to around 60% of all roads between 1995 and 2009. However, this is based on estimation. Most roads in the country are now not properly paved, and conditions of these roads worsen during the rainy season (AFDB, 2011).

While Zimbabwe boasts one of the most extensive road networks in the region, its condition has deteriorated rapidly over the past two decades. As of 2008, Zimbabwe has one of the lowest percentages of roads in good condition the region. The roads in poor condition include key regional arteries, such as the corridor leading to the port of Beira in northern Mozambique,
hindering the competitiveness of the port even though it is significantly closer to Zimbabwe than the port of Durban. The 2010 Zimbabwe Road Condition Survey paints an even more dismal picture of the current quality of classified roads. Only 34 percent of total classified roads are in fair or good condition and only 14 percent in good condition. The quality of paved/sealed roads is somewhat better than that of gravel and earth roads; nevertheless, a daunting 50 percent of classified paved roads are in poor condition and require costly rehabilitation. Based on the results of this survey, the government estimates that $2.9 billion would be needed to rehabilitate Zimbabwe’s entire classified network (Tshuma2, 2016).

According to Stewart (2011), the challenges that may hinder effectiveness in logistics include bad road infrastructure, traffic congestion, distance which may result in an increase in cost, climate changes, legislative challenges (funding disagreements and quarantine), technological challenges (additional costs, lack of integrated system, resistance to change and adjustment to technology), rising fuel prices and oversized shipments (Stewart, 2011).

1.3 Problem Statement

As indicated in Section 1.1 (Introduction) literature states it is essential for milk to have an effective logistics strategy which takes into account the specific attributes of milk which are short sell-by-date and implementation of immediate primary processing. According to Gözegir, Ertek and Büyüközkan (2008) dairy producers and retailers are in dire need of logistics companies that will care about the special needs and problems in their working environment. Literature further says that the recent progression in transportation has made it possible for perishables like milk to reach many areas around the world.

Unfortunately, the progression in dairy farming transportation does not seem to be taking place in Zimbabwe as demonstrated by the logistics problems cited in Section 1.2 (Background) above. If something is not done urgently, some of the dairy farmers will go out of business.

Therefore, it is paramount to examine the present state of logistics being implemented in dairy farming, with a view to suggest the most suitable ways for inbound and outbound logistics in order to minimize cost and maximize profit. Thus, the research problem is to evaluate the
effectiveness of logistics in the dairy farming value chain in Zimbabwe as part of revitalizing the national dairy industry.

1.4 Research Objectives

1.4.1 Prime Objective
To evaluate the effectiveness of logistics in the dairy farming Industry value chain in Zimbabwe.

1.4.2 Objectives

1.4.2.1 To assess the challenges that affect the success and failure of the inbound logistics component in dairy farming.

1.4.2.2 To analyse the challenges that impact the success and failure of outbound logistics in dairy farming.

1.4.2.3 To assess the impact of road infrastructure on logistics in dairy farming.

1.4.2.4 To find out the role and scope of information technology in logistics on dairy farms.

1.4.3 Research Questions

1.4.3.1 What are the challenges that have an impact on the success and failure of inbound logistics in dairy farming in Zimbabwe?

1.4.3.2 What are the challenges that impact on the success and failure of outbound logistics in dairy farming?

1.4.3.3 What is impact of road infrastructure on logistics in dairy farming?

1.4.3.4 How is information technology used in logistics on dairy farms?

1.4.3.5 What are the recommended measures that are required to build an efficient logistics strategy in Zimbabwe?
1.5 Research Proposition

The inbound and outbound logistics in dairy farming sector in Zimbabwe is not effective because of poor infrastructure.

1.6 Delimitation of the study

The study will be confined to dairy farmers located in Mashonaland East province.

1.7 Justification of Research

From Literature, all the studies that have been done in Zimbabwe by several authors emphasize on value chain activities (Marecha, 2009: SNV, 2012 and Matekenya, 2016). One of the studies was done by Marecha (2009), which was a study on the raw milk value chain. From the survey that was done by the author, the results showed that considerable amount of milk was being sold through the informal chain and that resettlement and communal farmers were milking the beef cows, thus, contributing 13, 5 million litres annually to the informal milk chain, to which they have access and are not linked to any formal markets. If the 13, 5 million litres, would be added to national production it would contribute to 25%. Therefore, the study concluded that the revival of the dairy industry is dependent on the success in inclusion of the small holder farmers into the formal chain (Marecha, 2009: p46).

The second study was conducted by SNV(Netherlands Development Organisation)(2012), on small holder farms and it identified the strategies required for improving smallholder farmer participation in commercial dairying which included: the adoption of inclusive business development models that ensure a shared vision and effective communication between processors and smallholder dairy farmers, credit facilities for increasing the dairy herd, and increasing producer prices, and enhancing the viability of smallholder dairying (SNV, 2012: p77).
Lastly, Matekenya (2016: p17), performed a study on the large scale dairy farmers value chain in Zimbabwe. In summary the study concluded that the dairy value chain in Zimbabwe is well coordinated. Also, the key stakeholders in the dairy value chain interrelate and support each other at all levels by establishing long term relationships to increase their efficiency and competitiveness to ensure sustainability of the chain. The author also highlighted the importance of international food quality and safety standards to protect the consumer which are practised at every stage of the dairy value chain. The processors have the largest value share in the chain because of their integrated role as wholesalers and retailers (Matekenya, 2016: p17).

Thus, it can be observed that all these studies carried out by different authors emphasized mainly on value chain activities in dairy farms. They failed to address the logistics and transport aspects of the dairy products and the minimum time required by the goods to reach the customer, especially considering its perishable nature. This is the identified gap in knowledge, which this study intends to bridge. It is to this effect that this research was set out to assess the logistics associated with the inbound and outbound logistics in dairy farming in Zimbabwe and will also examine the effectiveness of logistics in the dairy farming value chain.

1.8 Significance of the Research

This study will benefit the dairy industry with a new strategy they can adopt. Consequently, this study will pursue to clarify the relationship between logistics and generic business strategy in dairy organisations/industries by using the dairy farms in Mashonaland East as a case study. The focus is more on operations and distribution of raw milk (Sankaran and Luxton, 2003).

The research will also contribute to the academic institutions through providing information that will save as a research guide for future researchers in determining research gaps before engaging in any form of research related to the strategy of revitalizing the dairy industry.

The research will also provide with information to government regulators for the dairy industry such as the Department of Livestock and Veterinary Services (DLVS) on issues pertaining to logistics of feed, vaccines, raw milk and milk products as to/ from dairy farms.

Lastly, the research will also broaden the knowledge for the student doing the study since she is also a works in the veterinary field.
1.9 Structure of the Research

Chapter 1.0

This chapter covers the introduction of the research. The chapter also gives a background of the study, the background of the industry being used in the case study and the problem statement. The objectives and justifications of the research are also indicated in this chapter.

Chapter 2.0

This chapter focuses on the literature review. It outlines some of the work that has been carried out by other researchers and the theory on the subject matter which will help determine the research gap in the study area.

Chapter 3.0

This chapter will focus on the research methodology that will be used in carrying out the study. It will explain in detail the research design and method that will be applied in conducting the research and analysing the research findings.

Chapter 4.0

The chapter looks at data analysis and discusses the findings. This chapter will apply the theoretical framework from Chapter 2 to the case study, and will see how the selected theory can explain the results obtained from case study. Within this chapter, the posed research questions in chapter 1 will be answered. The findings from the case study are discussed in this chapter.

Chapter 5.0

This chapter will incorporate the conclusions and recommendations based on the findings of the study.

1.10 Summary of the Chapter

Chapter one (1) above explained the background of the dairy industry, the problems being faced by dairy farmers, the main purpose of the study and the vital significance of the research. The next chapter will entail the literature review of the area of study that is the definition of terms, theoretical review, empirical review and conceptual framework.
CHAPTER 2: LITERATURE REVIEW

2.0 Introduction

The main purpose of literature review is to survey previous studies on value chain, logistics and their impact on organisational performance. According to Denscombe (1998), literature review assists the researcher to scope the key data collection requirements for the primary research to be conducted and also, in forming part of the emergent research design process (Denscombe, 1998).

According to Hall (2004), an appreciation of literature review will serve three (3) main purposes that is:

1. provide direction in the construction of data collection tools and guard against the risk of overload at the primary data collection stages of the project.

2. the findings from literature will help maintain a sense of the topic’s perspective during the course of the study.

3. raises an opportunity for articulating a critical analysis of the actual “meaning” of the data collected when the data analysis stages of the research are reached (Hall, 2004).

This chapter provides an overview of literature which is believed to be relevant for this thesis. This review covers the concept of logistics, theoretical framework, empirical studies and conceptual framework. This chapter of the thesis will discuss, in more detail, important logistics concepts and definitions, some of which were introduced in the preceding chapter, and further introduces concepts and definitions relevant to logistics. The chapter also deals with important underlying concepts and definitions of logistics and supply chain management.

The information in this chapter also focuses on the meaning, role and importance of logistics and deals with the increasing recognition of the role and importance of logistics. This information is of a predominantly descriptive nature and presents the relevant concepts and definitions mainly in an introductory manner but will be clear and in sufficient detail to provide a background to the subjects discussed.
2.1 Definition of terms

**Logistics** can be defined as “the process of planning, implementing and controlling the efficient, effective flow and storage of goods, services and related information from their point of origin to point of consumption for the purpose of conforming to customer requirements” (Kannegiesser, 2018: p29).

**Logistics management** can be defined as that part of the supply chain process that plans, implements, and controls the efficient, effective flow and storage of raw materials, in-process inventory, finished goods, services and related information from the point-of-origin to the point-of-consumption (including inbound, outbound, internal and external flows) in such a way as to meet customers (CSCMP, 2018).

**Inbound Logistics** refers to the buying, storage and dissemination, of the incoming goods, to the production unit (Surbhi, 2017: p1).

**Outbound logistics** implies the transmission, selection, packaging and transportation of final goods to the consumers (Surbhi, 2017: p1).

**Supply Chain** “encompasses the planning and management of all activities involved in sourcing and procurement, conversion, and all logistics management activities. Importantly, it also includes coordination and collaboration with channel partners, which can be suppliers, intermediaries, third party service providers, and customers. In essence, supply chain management integrates supply and demand management within and across companies” (CSCMP, 2018).

**Distribution** is outbound logistics, from the end of the production line to the consumer/end user. It includes activities related with the transportation of material, generally finished products or service parts, from the producer to the purchaser (CSCMP, 2018). These activities incorporate the functions of transportation, warehousing, inventory control, material handling, order administration, site and location analysis, industrial packaging, data processing, and the communications network necessary for effective management. Distribution includes all activities related to physical distribution as well as the return of goods to the manufacturer. In many cases, this movement is made through one or more levels of field warehouses (Perez, 2007).
**Agribusiness** is defined as the business collectively associated with the production, processing and distribution of agricultural products (New Dictionary Literacy of Cultural, 2005).

**Scheduler** is a specialised employee at milk collection centres/processing companies to look after the routing of milk collection and allocation of the resources needed to perform the task (Butler, Herlihy, and Keenan, 2005).

### 2.2 Theoretical Literature

#### 2.2.1 Value Chain Model

The Value chain model was created by Porter. A value chain “disaggregates a firm into its strategically relevant activities in order to understand the behaviour of costs and the existing and potential sources of differentiation” (Kannegiesser, 2018: p11). Porter’s value chain consists of a “set of activities that are performed to design, produce and market, deliver and support its product” (Kannegiesser, 2018: p11). Porter distinguishes between:

(a) primary activities: inbound logistics, operations, outbound logistics, marketing and sales, service in the core value chain creating directly value, and

(b) support activities: procurement, technology development, human resource management, firm infrastructure supporting the value creation in the core value chain (Porter, 1985: p33-40, Kannegiesser, 2018: p11).

The idea of ‘Value Chain’ was discussed by Michael Porter in his book "Competitive Advantage: Creating and Sustaining Superior Performance" (1985). Basing on the fact that a business is a collection of distinctive and related activities, the value chain analysis represents a set of the activities the organization performs and links to the organizations competitive position in order to deliver a valuable product or service for the market (Porter, 1985). Since the set of events are within and around a business, there is a resilient relationship between analysing and linking them to identify the competitive advantage of the company. Therefore, the analysis helps to evaluate which specific value that each particular activity adds to the company products or services. And the more value that a company can create, the more willingly customers are to pay for the price and the more profitability the company can achieve.
Porter (1985) suggests that understanding and adopting a value chain is a source to identify competitive advantage of a company. Porter also differentiates more specifically between the set of activities that includes primary activities and support activities. Primary activities are those that relate directly to the creation, sale, maintenance, support or delivery of a product or service. They consist of the following five main areas: inbound logistics, operations, outbound logistics, marketing and sales, and service. Whilst, support activities include procurement, technology development, human resource management, firm infrastructure supporting the value creation in the core value chain (Kannegiesser, 2018).

The basic model of Porters Value Chain is as illustrated in Figure 3 below:

![Value Chain Diagram](image)

*Figure 2.1-Value Chain, Source: Porter (1985)*

On the other hand, according to World Business Council for Sustainable Development (WBCSD) (2011), “value chains are an integral part of strategic planning for many businesses today. A value chain refers to the full life cycle of a product or process, including material sourcing, production, consumption and disposal/recycling processes” (WBSCD, 2011: p3). The Figure 4 below illustrates the full life cycle:
The diagram above shows that logistics is at the centre of the value chain processes and thus, is an integral part of a business for it to gain competitive advantage.

### 2.2.1.1 Advantages and Disadvantages of Value Chain Analysis

The benefits of value chain management include: reduction of delivery times, optimization of inventory, improvement of customer relationships, and enhancement of revenue and profits (Kokemuller, 2018).

Reduction of delivery times and optimized inventory are closely related because if there are faster delivery times there is a capacity to optimize inventory levels. The decrease in inventory is the right thing to do when replenishment times are faster and more reliable and when it is done as part of an overall supply chain strategy (Perez, 2007). A good example, is when retailers work closely with suppliers to reduce transport times and coordinate the producer's outbound processes with the retailer's inbound logistics. Many retailers use "just-in-time" (JIT) inventory practices as part of value chain management and with JIT, the retailer makes smaller, more regular orders of goods to reduce inventory levels (Kokemuller, 2018).

The improvement of customer relationships is attained by managing the initial value chain factors, including inbound logistics, operations and outbound logistics, resellers which will result in improved response times and minimized costs for customers. It is of importance to note that the marketing and sales and service aspects of the value chain are particularly important to improving customer relationships.
Lastly the benefit of value chain management is to increase revenue and profit, it is the ultimate achievement and it is achieved through efficient logistics and distribution which ensures products available when customers want them. The combination of reduced logistics and distribution expenses as well as optimum price points and income will eventually result in the best possible profit for any business.

On the other hand, value chain analysis is no simple deed and some of the disadvantages faced involve gathering data (which can be labour and time-intensive), identifying the activities that can enhance assumed or real value, and developing and implementing the plan. Furthermore, it is not always easy to find suitable information in order to the value chain down into primary and supporting activities.

2.2.2 Logistics

2.2.2.1 The concept of logistic distribution

According to SOUZA (2002), logistics science was originated in the 18th century during the reign of Louis XIV there was the rank of Marsha l-General of Lógis-, responsible for supplying war material transport in the battles (Souza, 2002). On the other hand, Saumíneo (1998), says that the first general to use the term logistics was general Von Claussen of Frederick of Prussia, and the technique was developed after by the American intelligence (CIA), with Harvard professors, during World War II (Saumíneo, 1998).

Logistics started being used more frequently by companies around the world when information Technology (IT) was developed and implemented in the companies (Dias, 1993; Stock and Lambert, 2001). Initially, the term logistics was confined only to physical distribution of materials (Ching, 2001) and, along the time, this concept evolved and now it is understood as the integration among several areas.

The logistics objective is to allocate resources, like products, services and people, where they are needed and when they are desired. Logistics can be differentiated into inbound logistics and outbound logistics as illustrated in figure 5 below:
Section 2.1, the definition of terms highlights the definitions of inbound and outbound logistics. The table below summarises the differences between inbound and outbound logistic:

<table>
<thead>
<tr>
<th>BASIS FOR COMPARISON</th>
<th>INBOUND LOGISTICS</th>
<th>OUTBOUND LOGISTICS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meaning</td>
<td>The influx of raw material and parts, from suppliers to the manufacturing plant, is known as inbound logistics.</td>
<td>The outward movement of final goods, from the company to the end user, is known as outbound logistics.</td>
</tr>
<tr>
<td>Related to</td>
<td>Material management and procurement</td>
<td>Customer service and channel of distribution</td>
</tr>
<tr>
<td>Focuses on</td>
<td>Deployment of resources and raw materials, within the manufacturing plant.</td>
<td>Movement of finished goods or product from the business to final customer.</td>
</tr>
<tr>
<td>Interaction</td>
<td>Between supplier and the firm</td>
<td>Between firm and customers</td>
</tr>
</tbody>
</table>

Table 2.1- Difference of inbound and outbound logistics, Source: Surbhi (2017: p2)

To sum up logistics activities include inbound and outbound transportation management, fleet management, warehousing, materials handling, order fulfilment, logistics network design, inventory management, supply/demand planning, and management of third party logistics services providers (CSCMP, 2018).
2.2.2.2 Logics vs Supply chain management

The terms “supply chain management and logistics” are frequently used interchangeably. Nevertheless, they have different meanings and describe different areas of business operations as shown in section 1.1. Therefore, logistics is seen as that part of supply chain management that plans, implements, and controls the efficient, effective forward and reverses flow and storage of goods, services and related information between the point of origin and the point of consumption in order to meet customers' requirements” (USAID, 2011: p13 and CSCMP, 2018).

The major differences between the two terms is that supply chain management take a holistic view over the entire supply chain regardless of company boards, while logistics management is more concern about the flow of goods and liaises with other areas and functions only to support this task. Logistics is thus a subordinated part of supply chain management. The chart below illustrates the relationship among distribution, logistics management, and supply management.

![Figure 2.4- Relationship among distribution, logistics management, and supply management, Source: Peltz (2007)](image)

From Figure 6, it can be summed up that distribution is a component of logistics management, and logistics management is a component of supply chain management (Peltz, 2007)
2.2.2.3 Logistics and Transport system

Transport is the way used by companies to move goods/products from A to B through the many stages of the supply chain (Chopra and Meindi, 2007). The transport activity has huge effect on the level of the services and on the effectiveness of the supply chain. The choice of transportation model has a great impact on the consumer opinion of the product/service delivered. The preference for a faster transportation mode will reduce the delivery time but will increase the transportation cost. Thus, the transportation activity plays a significant part as a gauge of the stock levels and localization of the connections in the supply chain (Chopra and Meindi, 2007).

Most companies/enterprises use transportation activity as a competitive tool, to offer a superior service for their customers, as well as for companies, while transportation cost is critical for their results and consequently must be optimized. Transportation usually represents the most important single element in logistics cost for most of the companies. Freight movement have been observed to absorb between one-third and two-thirds of the total logistics cost (Ballou, 2004).

According to Chopra and Meindi (2007) all the decisions taken by the companies related to operations throughout the supply chain must consider the following means of transport that is air, road, rail, water and pipe (Chopra and Meindi, 2007). Each of these modes has its precise features with regards to capacity, speed, dimensions, trustworthiness and flexibility. According Rushton, Crucher and Baker (2006), before selecting the type of transport to suit the customer’s needs in terms of service level and efficiency a business should consider the following:

a. **External factors**: which are important to study the country/region infrastructures, trade barriers, license, law and taxation, financial institutions and services, economic condition of the region, communication system used in the region, as well as culture and climate.

b. **Customer characteristics**: this includes the service level requirements, delivery ports, constraints, credit rating, terms of sale preference, order size preference, customers’ importance and general product knowledge. These need to be addressed for both national and international transportation mode choice.
c. **Physical nature of the product:** this has to do with the obtaining knowledge on volume to weight ratio, value to weight ratio, product substitutes, and special characteristics such as risk, delicateness, perishability, time constrains and safety.

d. **Other logistic components:** This includes the supply point locations, production plant locations, warehouse and storage facility locations, marketing plans and policies and existing delivery system. (Rushton, Crucher and Baker, 2006)

Companies can choose from numerous modes of transportation to transport their raw materials and products. This availability allows the companies to contact the transporters firms whenever it suits them (Chopre and Meindi, 2007).

### 2.2.2.4 Outsourcing in transport

According to Horngren, Foster and Datar (2000), outsourcing is “the process of purchasing goods and services from outside vendors rather than producing the same goods or services within the organization, which is called insourcing (Horngren, Foster and Datar 2000: pp383). Outsourcing can bring advantages to some enterprises but not for all of them and the choice of outsourcing or keeping it internal solely depends on the type of business and its supply chain structure (Chopra and Meindl, 2007). Many companies have experienced problems managing the complex and growing supply chain, in regard to management of: quality, lead-time, delivery reliability and purchasing (Hill, 2000).

For dairy companies, the choice of keeping the milk collection in house or outsourcing needs to be cautiously deliberated upon and scrutinised in order to come up with a decision that best suits the enterprise. It is also necessary to study the market environment where the enterprises trade as the conditions and even the way to do business differ from market to market.

The benefits of outsourcing include: better economies of scale, more efficient procurement transactions, better coordination of the chain, lower inventory, better match between demand and forecast, reduction in cost and lower capital activities, access to technology and management skills, improved customers service, competitive advantage such as through increased market penetration, increased access to information for planning, reduced risk and uncertainty and reduction in transportation/distribution (Chopra and Meindl, 2007).
2.2.2.4 Logistics intermediaries

Logistics intermediaries come in different forms and under different names, but they all have the similar objectives that is to offer help to firms in the transportation, storage, shipment and distribution of products from the seller to the buyer or the final customer, at a certain charge. Namely logistics intermediaries in trade include freight forwarders, Third party logistics (3PL), Fourth party logistics (4PL) or LLP (Skender, Host and Nuhanovic, 2016).

**Freight forwarders** are an intermediary, organizing goods movements and providing other related services along a chain of transport and logistics operations (Schramm 2012, p. 9-10). They reduce the time and costs for their clients by finding solutions to the biggest complexities in international shipments and combining together many small shipments into a one large shipment. They actually take care of everything; selection of the mode of transport, the route, the payments, international shipping requirements and documentation. International freight forwarders are the most known and common type of logistics intermediary or facilitator (Skender, Host and Nuhanovic, 2016).

**Third - party logistics(3PLs)** service providers coordinate carriers, logistics intermediary firms, and other service suppliers (Domingues, Reis, and Macario, 2015) These service providers play the role of a middleman between the seller and the buyer, render transportation, warehousing services and engage in performing other services such as consolidation and deconsolidation; cross -docking; picking and packing; custom clearance; track and trace information; insurance services; payment services; tendering and contracting carriers; and forwarding services (Stefansson, 2006). 3PLs have similar duties as freight forwarders but are not limited to those mentioned in this paragraph.

In comparison, it is said that **fourth party logistics (4PLs)** are superior to 3PLs. While 3PLs are mainly responsible for the logistics operations and activities, 4PLs are also responsible for the development and maintenance of all of the logistics projects. 4PLs perform the same tasks as 3PLs but in a more strategic way. They are focused on the maintenance, improvement and management of a firm’s supply chain. Therefore, 4PLs can be defined as “asset-free logistics middlemen offering expertise for the establishment and control of complex logistics systems, including logistics consulting and the organization of information infrastructure, transport, logistics as well as financial services that are needed” (Schramm, 2012, p. 154).
Lastly, the fifth-party Logistics (5PLs) were brought about by the requirement for more developed service provider. The 5PLs are still evolving and their main focus of work is on technology (Hickson, Wirth and Morales, 2008: p. 12). They, like 4PLs, do not have physical assets, and are much more focused on technology in the supply chain management, i.e. on the strategic management of the supply chain. Fifth party logistics providers utilize new technology to manage the whole supply chain and logistics network. They organize and plan possible solutions in the logistics processes on behalf of the company by trying to find the appropriate technology. They usually cooperate with large companies whose networks are much more complex and aim to create an efficient environment (Skender, Host and Nuhanovic, 2016). The table below differences and similarities between logistics service providers:
<table>
<thead>
<tr>
<th>Intermediary</th>
<th>Freight forwarder</th>
<th>3PL</th>
<th>4PL</th>
<th>5PL</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type Of Service</strong></td>
<td>Tactical</td>
<td>Tactical</td>
<td>Strategic</td>
<td>Strategic - IT Supply Chain</td>
</tr>
<tr>
<td><strong>Basic Idea</strong></td>
<td>Arrange the transport and coordinate the movement of goods, prepare necessary paperwork, arrange storage and insurance</td>
<td>Performs multiple, or all, physical logistics functions on behalf of customer</td>
<td>Performs all supply chain functions for the customer; concerned with the management and improvement of the client's supply chain</td>
<td>Turns customer's supply chain into a function that is completely driven by technology</td>
</tr>
<tr>
<td><strong>Resources</strong></td>
<td>Usually owns few physical assets, knowledge and technology assets</td>
<td>May or may not own physical assets; mainly knowledge-based, technology for tracking shipments</td>
<td>Few physical assets, extensive knowledge and technology-based assets</td>
<td>Few physical assets, extensive knowledge and technology-based assets</td>
</tr>
<tr>
<td><strong>Potential Benefits</strong></td>
<td>Companies, especially smaller firms, who ship internationally, arrange most cost-efficient route for shipments</td>
<td>Companies who lack internal supply chain resources and knowledge</td>
<td>Companies with complex supply chains</td>
<td>Large companies with highly complex supply chains</td>
</tr>
<tr>
<td><strong>Potential Drawbacks</strong></td>
<td>Unknown</td>
<td>Focused more on moving freight than the management and efficiency of the supply chain</td>
<td>Loss of control and relationships with supply chain members, risk in long-term partnerships</td>
<td>Loss of control and relationship with supply chain members, risk in long-term partnerships</td>
</tr>
</tbody>
</table>

Table 2.2- Differences and similarities between logistics service providers, Source Hickson et al. (2008: p. 13)
2.2.3 Logistics system in Agribusiness

Logistics and the use of its components are of big importance in manufacturing but it has not been studied systematically and its suitability has not been approbated in the agriculture sector. It is likely that this reason has stirred several foreign researchers such as (Radžele and Krieviņa, 2009, Sankaran and Luxton, 2003 and Ngigi and Wangai, 2012) to pay special attention to the research of logistics systems, components and elements in the agriculture sector.

The studies of foreign researchers on logistics in the agriculture sector comprise a wide range of topics such as minimizing logistics risks; use of logistics outsourcing; flow of material resources, its management and optimisation possibilities in the agriculture sector; opportunities to apply information technology; impact of state policy and decisions on logistics organisation in the agriculture sector; logistics organisation in the agriculture sector at the national level, its impact on the export development; assessment of the quality and capacity of the infrastructure of agriculture logistics.

According to Radžele (2009), the application of logistics systems in agriculture is especially relevant and necessary because the agriculture sector operates in a very changing and difficult-to-predict environment for example in in crop farming, beef farming or dairy farming. The main goal of logistics in agriculture is raising value added and the complementary goals are increasing work efficiency, production process efficiency and reducing costs (Radzele, 2009).

In cattle-breeding the processes are even more articulated because the production output is a live organism, which requires the farmer to follow the production process cautiously. The farmer may rear the cattle for dairy or beef production. If it is for beef, slaughtering of the cattle may take place only in special certified abattoirs, and if it is milk the dairy cattle will be milked in hygienic milking parlours or areas on the farm. Lastly, the transportation of animals/milk requires specially equipped transport with special temperature regime, and sanitary hygiene conditions should be provided.

However, the advance of logistics systems in agribusiness is essential because an agricultural enterprise (farm) does not perform all the value chain activities such as product manufacturing and sales operations all at once, they tend to focus on production. Thus, this type of operations requires agricultural enterprises to manage the supply chain including logistics successfully. (Radžele and Špoāis, 2007)
Therefore, the need for the use of logistics principles and systems in the agriculture sector in Zimbabwe is mainly determined by the fact that farms are widely dispersed and for agricultural enterprises to be competitive, they should offer quality products for a low price and within a possibly short time period. This can be achieved by developing successful partnerships in managing logistics systems as a way to maintain and strengthen the market position. The diagram below summarises the logistics system in the dairy sector:

![Diagram of logistics system in dairy sector](image)

*Figure 2.5- Flow of material resources in the dairy production sector, Source Radžele and Krievița (2009)*

From Figure 7, three major components of logistics systems can be distinguished in dairy farming which are:
i. supply of dairy farmers with all the necessary resources – feed, supplements, veterinary medicines, hygiene products, equipment, etc.;

ii. milk collection and transportation to processing enterprises, as well as the supply of the processing enterprises with other raw materials and materials – food additives, chemicals, containers, etc.;

iii. distribution of dairy products to the end users.

2.2.3.1 Ways of transporting milk

The most common methods of milk transportation are using churns and road tankers. In both ways, the milk must be kept at 4°C, free from air and treated as smoothly as possible (Sobrinho, 1995).

a) Transportation in Churn

The churns generally have capacity of 20 to 50 litres, have a cylindrical form and are made of tin, steel or aluminium. In this case, the milk is cooled using cold water or ice and then placed into the storage place and moved to the collection point just before the truck comes, collects and takes them to the milk station (Sobrinho, 1995). Milk collection from the collection point has to be well planned so that trucks collect the milk at the same time every day.

After being collected, the churns must be taken straight to the milk collection centres or to the processing plants. However, this type of transportation has considerable effect on the quality of milk, due to bacterial proliferation. This happens because the churns are placed on the side of the road waiting for the truck, which allows an increase in temperature (Sobrinho, 1995).

b) Bulk Collection

The second option of milk collection is using milk tankers. In this case, the milk is collected in bulk from farms which have a special room to keep the milk cooled or have a cooling tank. The last one is becoming more common nowadays.

The bulk tankers have capacity that vary between 300 to 30,000 litres, with an agitator to keep the milk in the tank at a homogeneous temperature and a cooling system to meet the milk storage requirements, that is, 4°C two hours after milking. In some big farms, there are separate plate coolers for chilling the milk before it enters the bulk tankers (Sobrinho, 1995).
In this case, the milk tanker drives all the way through the bulk tank and connects its hose to the cooling tank outlet. The milk is then transferred to the road tank which is equipped with a pump and a meter to record the volume of milk collected (Sobrinho, 1995).

The milk collection in bulk has produced innumerable advantages in milk agribusiness and its chain members (producers, companies and consumers). This collection system reduces the collection costs of the raw material, eliminates the necessity of collection point, increases the productivity in the farm by having flexibility on milk scheduling and the possibility of having a second milking on the same day, significantly increases the quality of the milk that arrives for processing in the plants and finally the consumers gain with the improvement of the raw material. This process makes possible that the milk collected at the farm conserves its properties by immediate cooling (Martins et al, 2004).

In spite of all the advantages obtained by bulk collection, there are some barriers that make the implementation of this system:

- The difficult access to the country properties
- The lack of electricity or oscillations on its supply
- The cost of acquisition and maintenance of the cooling tanks
- Small production of some farms.
- The routing that involves the bulk collection.
- Risk of contamination of the whole tank by one farm batch. (Sobrinho, 1995)

Furthermore, the transportation costs must consider the regional aspects and the specific characteristics of each activity such as conditions of the roads, volumes carried at different times of the year and cost of fuel.

2.2.4 Benefits of logistics management

Meeting customer demand and providing superior service is one of the most important benefits of good logistics management. Consumers demand better service and this mandate has ripple effects up the supply chain, creating a need for shippers to provide fast, accurate and quality service. Thus, logistics management is responsible for satisfying customer demands.
Logistics management is also important for creating visibility into a company’s supply chain. Advanced transportation management systems (TMS) analyse historical data and track real-time movement of goods into and out of a business. Logistics managers can use this information for process optimization and avoiding potential disruptions. TMS data analysis keeps a company’s supply chain moving more efficiently, all while gaining operational insight.

Proper logistics management drives increased revenue. Improved customer service can bring a good reputation to a company’s brand and generate more business, and supply chain visibility creates opportunity for major cost savings in operations. Logistics management will give a company control over inbound freight, keep inventory at optimal levels, organize the reverse flow of goods, and utilize freight moves on the proper transportation modes – all of which can cut costs significantly.

With the growing complexity of logistics management, many companies select a 3PL to manage some or all of their logistics functions. 3PLs have expertise and advanced technology to cut costs and improve processes much more efficiently than companies can in-house.

2.2.5 Information technology in logistics

As the supply chain gets longer and extends beyond national boundaries, effective communication and information infrastructures to support such complex processes and systems become essential (Erenguc, Simpson, and Vakharia, 1999). Thus, information technology and telematics allow mathematical models to be applied within real-time systems and process controller. The development of telecommunications and information technology has created many opportunities to increase the integration of logistics functions such as raw material purchasing and the distribution of products to customers. This increases the performance in the entire logistics system and helps achieve a win-win solution for all the participants: suppliers, customers and intermediaries (Slats, et al, 1995).

The first attempt at using computer software to manage milk collection and replace the schedulers was not successful. The aim of software was to minimize the cost without checking the interest and constraints of the other parts such as difficult access to the farms, drivers work hours, truck size, and farms routines. Consequently, a Decision Support System (DSS) which is software that is intended to support the schedulers and not replace them was developed.
In the 1990s a number of routing systems were developed such as The Milk Collection Fleetmanager system in New Zealand (Butler, Herlihy and Keenan, 2005). The first generation of DSS had only information about route and volume of the milk. Later on a data base called geographic information system (GIS) was developed which was incorporated to DSS and allowed it to have more information about milk collection, such as (Butler, Herlihy and Keenan, 2005):

- Supplier name
- Telephone number
- Supplier code
- Volume collected at most recent collection
- Butterfat for most recent test
- Protein for the most recent test
- Lactose for most recent test
- Total bacteria count (TBC) for most recent test
- Somatic cell count (SCC) for most recent test
- Total supplies to date
- Quota
- Reference butterfat
- Butterfat adjusted quota position (% of quota used)

Furthermore, other technical developments such Geographic Position System (GPS) was included into the DSS. This tool has also assisted to calculate the travel distance and time more accurately which is really important in this case as the rural road network is quite spread out and the road distance between two points can be much further than the coordinate distance (Butler, Herlihy and Keenan., 2005). All this information helps the scheduler to have a better view of the changes made on the routing collection and its implications.
Although DSS provides great information about the milk collection it is also necessary to have a system that works in parallel with DSS. This system is used by the dairies manager to plan and control all aspects of the milk collection system such as (Figure 8):

- Allocation of the tank truck to weighbridge
- Milk quota for each farm
- Payment to each farm

![Data flow in milk management system](source)

*Figure 2.6- Data flow in milk management system: Source Butler, Herlihy and Keenan, (2005)*

### 2.3 Empirical Review

The purpose of this study will be to evaluate the effectiveness of logistics in the dairy farming value chain in Zimbabwe. To obtain insight into previous case studies concerning logistics in dairy farming, below are summaries of studies performed in Kenya and New Zealand.

#### 2.3.1 The case of Kenya

A research done by Ngigi and Wangai (2012), was on a case study of a dairy company referred to as “Fresha”. This study was carried out to address milk collection challenges of a local rural dairy company in Kenya. It involved the determination of optimal routes in a milk collection chain involving 10 routes and 40 collection centres. The milk processing factory, collection centres, road network, trading centres were mapped from
both primary and secondary data sources. A topologically clean geometrical network dataset of the roads was also created, together with vehicular information from the milk company, the most economical and efficient routes were determined through the application of vehicle routing problem (VRP) solution in a GIS environment (Ngigi and Wangai, 2012). A comparison was undertaken to compare the current costs in terms of time and distance with those generated, which revealed a substantial saving in time and distance if the dairy could adopt the VRP solution. Also, the milk society cited high operational costs in their milk collection activity as one of the biggest challenges. This problem was exacerbated by roads which were worse during the rainy season which resulted in an increase in the cost of transport through use of long routes in addition to other factors such as time spent during milk collection, capacity of trucks and scattered milk collection points (Ngigi and Wangai, 2012: p232).

Therefore, the lack of a logistics system in Kenya contributed to a lack of milk collection, delivery and distribution, lack of suitable routes assignment for trucks, besides the routes and the collection points not being mapped (Ngigi and Wangai, 2012: p232).

The study was concluded by recommending GIS and logistics in route planning and scheduling which would bring benefits to the dairy company by saving time, mileage and labour. The mapping of the dairy’s catchment area with all the milk centres, roads and other important facilities, would offer an essential base map for the management and operations staff in scheduling their activities. Lastly, a GIS system would enable the dairy farmers to use short and cheaper routes during the milk collection, with high rate of return within a short period, a decision that the traditional methods of handling data are incapable of providing (Ngigi and Wangai, 2012: p237).

2.3.2 The case of New Zealand
The study was seeking to clarify the relationship between logistics and generic business strategy in dairy organisations in New Zealand. The focus of the study was more on operations rather than distribution and service. Their objectives were to review the various ways in which efficiency has been realised in logistics in the industry and also examine the extent to which analysis of supply chain efficiency extends to other industries (Sankaran and Luxton, 2003).

According to Sankaran and Luxton (2003), the major cost in the dairy industry in New Zealand is the collection of milk from the dairy farms (Sankaran and Luxton, 2003: p533). Thus, they
suggested that careful management of collection costs should become more important with the consolidation of processing sites. Therefore, focus has been more on tanker routing, allocation and scheduling to reduce costs and to improve efficiency in the dairy industry (Sankaran and Luxton, 2003).

The study also cites the use of a Decision Support System (DSS) that was developed and implemented at Westland which was a major success because the manual system used to take six hours each day, while the new system now takes 60-90 minutes. The transport office believed that the schedules had improved and were generating savings for the company (Sankaran and Luxton, 2003: p534)

In conclusion, the authors recommended the installation of global IT system (GISP) to remove non-value adding activities in the logistics process worldwide, centralised personnel for example engineers, and positive incentives for enterprises so that they continually improve their operations (Sankaran and Luxton, 2003: p542).

All the studies cited in the empirical review did not review the effectiveness of inbound and outbound logistics in dairy farming which is going to be my area of focus in this study.

2.4 Conceptual Framework

The study will be guided by the conceptual framework below which assists in the analysis of transparency, traceability and information flow adapted to dairy logistics.
LOGISTICS KEY ELEMENTS

Inbound logistics
Outbound logistics
Supplier consumer relationship
Logistics strategy

INDEPENDENT VARIABLES
Assumed Cause

Extraneous Variables

 ✓ Bad road infrastructure
 ✓ Traffic congestion
 ✓ Inconsistent Regulatory policies
 ✓ Technological challenges
 ✓ Lack of Integrated system

AFFECT THE RELATIONSHIP

DEPENDENT VARIABLES
Assumed Effects

➢ Profitability
➢ Competitive advantage within the industry
➢ Reduced delivery times and optimized inventory

Fig 2.7- Conceptual Framework, Source Adapted from Mugenda & Mugenda (2008)
2.5 Chapter Conclusion

This chapter has discussed the value chain model, the relationship between logistics and supply chain management, mode of transport and the benefits of logistics management in literature in other countries in the world. However, the available literature is incomplete as it does not answer the current research objectives stated in chapter 1; hence this study will examine the effectiveness of logistics in dairy farming in Zimbabwe. This study is guided by the conceptual framework in Figure 2.7 (on page 37) and the research methodology will be in the next chapter.
CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

The previous chapter revealed the relevant literature on which the study was based and mainly focused on demonstrating how the present study relates into previous literature on the role of logistics in the value chain. This chapter will cover the research methodology used for the study. A research method can be defined as a tool to solve problems when the research problem has been identified, it is used as a tool to carry out the process and find solutions or answers to the problem (Ghauri & Grønhaug 2005: p40).

In this chapter, the researcher will examine the main parts of the current study that is the research design, research philosophy, research strategy, data collection and data analysis.

3.2 Research Design

According to Yin (2014), research design is the logical sequence that connects the empirical data to the study’s initial research questions and ultimately to its conclusions (Yin, 2014: p26). The main purpose of the research design is to avoid a situation where the evidence does not address the research questions. There are three main research designs which are Exploratory; Descriptive and Causal (Saunders, Lewis and Thornhill, 2009).

The researcher used a descriptive research design of dairy farms in Harare district. A descriptive research aims to describe a phenomenon the ways it is, for example, describing social systems or relationships between events (Adams et al., 2007).

The Descriptive research is designed based on the research question and the methodologies used throughout the research. This type of research analyses research questions such as; Who, What, Where, How to discover the nature of a situation or phenomenon as it exists (Adams et al., 2007).

3.2.1 Justification for descriptive research design

The first advantage is that participants are observed in a natural and unchanged environment. In this case, farmers are observed in their natural set up, that is on the dairy farms. Secondly, a
descriptive research permits the gathering of in-depth information that may be either quantitative (surveys) or qualitative (observations or case studies) in nature. This allows for a multifaceted approach to data collection and analysis. For example, researchers can use both case study which is a qualitative analysis and correlation analysis to describe a phenomenon. (Kothari, 2004: p114).

Therefore, in view of the advantages mentioned above the descriptive design is the suitable approach for the study.

3.3 Research Philosophy

A research philosophy is a belief about the way in which data about a phenomenon should be gathered, analysed and used. In simpler terms, it is developing knowledge in a particular field (Saunders, Lewis and Thornhill, 2009: p138). The research philosophy that is adopted contains important assumptions about the way in which the world is being viewed. These assumptions will underpin the research strategy and the methods that are chosen are part of that strategy (Saunders, Lewis and Thornhill, 2009).

The research philosophies from literature are Positivism, Realism, Interpretivism and the Pragmatism. For this study, the researcher was more inclined to the interpretive paradigm.

A research can be classified as interpretive (qualitative) if it assumes that the knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools, and other artefacts. The aim of all interpretive research is to understand how members of a social group, through their participation in social processes, enact their particular realities and endow them with meaning, and to show how these meanings, beliefs and intentions of the members help to constitute their social action (Klein & Myers, 1999: p.69).

3.3.1 Quantitative Approach

Denzin and Lincoln (2005), define quantitative research as a methodology that makes useful descriptions of observed phenomena and explains the possible relationships between descriptive surveys, longitudinal developments, correlational and ex-post factors research designs (Denzin and Lincoln, 2005).
3.3.2 Qualitative Approach

According to Denzin and Lincoln (2005), qualitative research is described as multi-method in focus which involves an interpretive, naturalistic approach to its subject matter” (Denzin and Lincoln, 2005: p2). On the other hand, Flick (2014) defines Qualitative research as “interested in analysing subjective meaning or the social production of issues, events, or practices by collecting non-standardised data and analysing texts and images rather than number and statistics” (Flick, 2014: p542). Therefore, qualitative research appears to be an all-encompassing concept under which a variety of issues may be placed, and it has positive and negative perspectives.

3.3.3 Merits of Qualitative Approach

Firstly, qualitative research approach yields the detailed portrayal of participants’ feelings, opinions, and experiences; and interprets the meanings of their actions (Rahman, 2017).

Secondly, there are some who claim that qualitative research approach (interpretivism) holistically comprehends the human experience in particular settings. Denzin and Lincoln (2005), for example, mentioned that qualitative research is an interdisciplinary field which embraces a wider range of epistemological viewpoints, research methods, and interpretive techniques of understanding human experiences (Denzin and Lincoln, 2005).

Thirdly, interpretivism research approach is regarded as an ideographic research, the study of individual cases or events (Klein and Myers, 1999); and it has abilities to understand different people’s voices, meanings and events. So the source of knowledge in this approach is the meaning of different events (Richardson, 2012).

Lastly, qualitative research design (interactive approach) has a flexible structure as the design can be constructed and reconstructed to a greater extent (Maxwell, 2012). Thus, the thorough and appropriate analyses of an issue can be produced by utilising qualitative research methods, and therefore the participants have sufficient freedom to determine what is consistent for them (Flick, 2011). As a result, the complex issues can be understood easily.

3.3.3 Selecting the Suitable Approach

Therefore, the research philosophy for this study was qualitative (interpretivist) because a qualitative research provides a complete and detailed description of a subject without limiting
the scope of the respondents' answers (Collis & Hussey, 2003). Thus, it will assist the researcher to gain more in-depth info and hence assist in generating appropriate conclusions with respect to the research questions by utilizing questionnaires (Mugenda & Mugenda, 2008). Lastly, the data will be in word or narrative form, and it is subjective depending on the respondents' point of view about a subject (Langkos, 2014).

3.4 Research Strategy

The research strategy is how the researcher intends to carry out the work and the general plan of answering the research questions. Research strategy include a number of different approaches, such as case studies, experiments, surveys, histories and the analysis of archival information (Yin, 2014). Yin further states that these strategies have peculiar merits and demerits depending on three (3) conditions which are listed below:

i) The focus on contemporary as opposed to historical phenomena
ii) The type of research question
iii) The control the investigator has over the actual behavioural phenomena (Yin, 2014: p27)

For this research, the researcher used the case study research strategy.

3.4.1 Justification of case study approach

A case study approach is essentially an intensive investigation of the particular unit under consideration and it helps the study narrow down a very broad field or population into an easily researchable one and seeks to describe that unit in details, in context and holistically (Kombo & Tromp, 2006).

Therefore, this research made use of a single case study approach with multiple respondents which will assist the researcher in getting in depth information about the effectiveness of logistics in the dairy farming value chain in Zimbabwe. The case study approach was deemed most appropriate in this study since data was gathered from a single source; the dairy farmers in Harare district to represent all dairy farmers in Zimbabwe. Also, this study comprised of questions like ‘how’ and ‘why’ about a contemporary set of events, over which the researcher had little or no control (Yin, 2014), hence the application of a case study.
3.5 Data collection

3.5.1 Population

Polit and Hungler (1999) refer to the population as an aggregate or totality of all the objects, subjects or members that conform to a set of specifications (Polit and Hungler, 1999: p37). In this study the population is going to be the dairy farms and milk processing companies in Zimbabwe. The population will comprise of dairy farmers in Harare district.

3.5.2 Sampling Strategy

The process of selecting a portion of the population to represent the entire population is known as sampling (Polit & Hungler 1999: p95). The sampling procedures can either be probability or non-probability sampling. It has been cited above on 3.3 that the research is going to be qualitative.

In qualitative research only a sample (a subset) of a population should be selected for any given study and the study’s research objectives and the characteristics of the study population (such as size and diversity) determine which and how many people to select. Qualitative research methods use non-probability type of sampling (Polit & Hungler 1999).

The non-probability methods include quota sampling, convenience sampling and judgemental (purposive) sampling (Saunders, Lewis and Thornhill, 2009: p233). The sampling method of choice for this study is going to be purposive sampling because the sample members are going to be selected on the basis of their knowledge, relationships and expertise regarding a research subject (Freedman et al., 2007). It should be noted that the sample members who are going to be selected will have special vast knowledge of the day to day running of a dairy farm such as the individual farm owners or managers, who have sufficient and relevant work experience in the field of dairy and are actively involved in the dairy value chain.

3.5.2.1 Purposive Sampling
Purposive sampling defines a non-probability sampling technique that enables the researcher to use his/her judgement to select cases that will be to best enable answering of the research questions and to meet the research objective (Saunders, Lewis and Thornhill, 2009). This is one of the most common sampling strategies which involve grouping participants according to pre-selected criteria relevant to a particular research question (Denzin and Lincoln, 2005).

3.6 Research Instruments

3.6.1 Questionnaires

Questionnaires will be used to collect primary data. The questions asked were semi-structured because open-ended questions provide rich insights which give the respondents freedom of answering the questions and a chance to offer in-depth responses (Mugenda & Mugenda, 2008).

The Advantages of Questionnaires include that there is anonymity and respondents are comfortable to answer any question without feeling any pressure or bias. Also, they are inexpensive. On the other hand, the disadvantages include that the response rate may misread or misunderstand a question and as a result the response given will not be the correct one.

Another limitation is that the response rate may be low if the respondent lacks interest and the respondent may be interested in certain questions resulting in a partially complete questionnaire. (Saunders, Lewis and Thornhill, 2009)

3.6.2 Personal interviews

The information required to answer the research questions was obtained through personal interviews which enabled the researcher to attain more understanding and knowledge of the current logistics system being employed by dairy farmers.

Personal interviews are more appropriate for the particular questions which are going to be explored because they permit further probing by using tactics such as repeating the question,
pause probe, repeating the respondent’s reply and seeking clarification (Saunders, Lewis and Thornhill, 2009).

Therefore, the study under research used this method of personal interviews so as to eliminate both bias and cut on costs. These personal interviews were conducted with individual farmers or farm managers, and any personnel at the farm whom were directly involved in the logistics of dairy products in order to obtain in-depth information.

3.7 Data Analysis and Write-up

There is no standard format in data analysis in qualitative research (Neuman, 2006). The data was analysed by going through all the questions and establishing common themes, patterns and relationships (Miles and Huberman, 1994). All the information gathered was analysed against theory cited in the literature review and the appropriate inferences were made.

3.8 Chapter Conclusion

This research chapter looked at the research methodology and the design of the research which is the whole research plan. The main focus was on the research philosophy that was adopted which is qualitative research, with an inductive approach. A single case study with multiple respondents was used and data collected using semi-structured interview guide. Lastly, data displays and write-ups were chosen to analyse findings. In the next chapter the researcher discusses and analyse the findings of the research.
CHAPTER 4: RESULTS AND FINDINGS

4.1 Introduction

In this chapter, the researcher presents the research findings that were done through the use of questionnaires to farmers. The data was then analysed by means of summary tables. The tabulated results were also explained and discussed including their implications and relationship to literature. The chapter will cover all responses per each posed question during the interviews.

4.2 Zimbabwe Dairy Farmers

This section is sub-divided into sub-sections for the carried-out interviews with the Dairy farmers in Mashonaland East province. A total of 15 questionnaires was distributed to dairy farmers in Mashonaland East, 12 were returned to the researcher. This represents a response rate of 80%. This percentage was considered sufficient for this study. This response rate was excellent and representative and conforms to Mugenda and Mugenda (1999) stipulation that a response rate of 50% is adequate for analysis and reporting; a rate of 60% is good and a response rate of 70% and over is excellent. The 25% who never returned the questionnaires cited busy schedules as the main reason and had no time to fill them.

4.2.1 Section A: Demographic & Background Information:
The findings in table 4.1 show that the majority (9 out of 12) of the respondents have been working in the dairy farming sector for more than 5 years and only a few farmers, 3 out of 12, are below 5 years’ experience. The table also highlights that all the farmers interviewed, were

Source: Primary Data
directly involved in the daily management of the farm operations as indicated by the tasks and responsibilities they participate in. The fact that all the selected interviewees were involved in the day to day operations and management of the farm enabled the researcher to attain rich and valuable information from the interviews.

4.2.2 Section B: Inbound / Procurement Logistics

This section contains the questions regarding inbound logistics from agricultural input suppliers to dairy farmers. The basic objective of this section is to find the micro and macro factors that affect the logistics network and if there is timely delivery. The section below covers: degree of responsiveness from suppliers, inbound logistics delivery mode, effectiveness of inbound logistics, challenges encountered in inbound logistics and how inbound logistics challenges have been dealt with.

**Question 1:** What is the degree of responsiveness from your suppliers when you place an order?

**Table 4.2 Degree of responsiveness from suppliers**

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Fair</td>
</tr>
<tr>
<td>B</td>
<td>Good</td>
</tr>
<tr>
<td>C</td>
<td>Good (scale of 1 to 5, score 3)</td>
</tr>
<tr>
<td>D</td>
<td>Not bad</td>
</tr>
<tr>
<td>E</td>
<td>Good</td>
</tr>
<tr>
<td>F</td>
<td>3/5 (on a scale of 1 to 5)</td>
</tr>
<tr>
<td>G</td>
<td>Very good</td>
</tr>
<tr>
<td>H</td>
<td>Not bad</td>
</tr>
<tr>
<td>I</td>
<td>None (use of own transport)</td>
</tr>
<tr>
<td>J</td>
<td>Good</td>
</tr>
<tr>
<td>K</td>
<td>Use own transport</td>
</tr>
<tr>
<td>L</td>
<td>Very responsive</td>
</tr>
</tbody>
</table>

*Source: Primary Data*

The responses in table 4.2 depicts that the majority (10 out of 12) farmers rate the degree of responsiveness from input suppliers to be good or a rate of 3 on a scale of 1 to 5. On the other
hand, 2 out of 12 farmer use their own transport to purchase their own supplies, thus they could not rate the responsiveness of input suppliers.

**Question 2:** Please explain how your inputs are brought to the farm?

| **Table 4.3 Inbound logistics delivery mode** |
|----------------|----------------------------------|
| **Farmer** | **Response** |
| A | • Bulk consignments are delivered to the farm  
   • Small orders collect on their own |
| B | • Delivered on farm due to large scale operations |
| C | • Bulk consignments (i.e. above 10 tonnes) are delivered to the farm  
   • Small orders collect on their own |
| D | • Delivery by suppliers |
| E | • Bulk consignments are delivered to the farm  
   • Small orders collect on their own |
| F | Use of own transport (only small scale operations) |
| G | By agricultural suppliers |
| H | Use of own transport |
| I | Buying of inputs whenever they travel to town |
| J | Use of own transport |
| K | Use own transport |
| L | • Own transport  
   • Hired transport  
   • Supplier transport |

*Source: Primary Data*

The findings in Table 4.3 shows that farmers such as farmer A, B, C, D, E, G and L who have a tendency of buying inputs in bulk, that is above ten tonnes, are usually provided with delivery services by the supplier and they use their own transport to collect small orders. In contrast, farmers F, H, I, J and K who usually have small orders use their own transport to access inputs. This view is supported by a study done by Pishvae, Basiri and Sajadieh (2009) which highlights that logistics costs are a proportion of product price.
Question 3: What has been the effect of this transport system on your dairy farm operations?

Table 4.4 Effectiveness of Inbound Logistics

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
</table>
| A      | • Timely delivery ensures efficient operations  
     | • Delays in deliveries of inputs stalls all operations  
     | • Delivery by input supplier cheaper than third party transporters |
| B      | • Increase in operational costs due to distorted transport pricing |
| C      | • Timely delivery ensures efficient operations  
     | • Delays in deliveries of inputs stalls all operations |
| D      | • Delay in deliveries |
| E      | • Own transport is costly |
| F      | Use of own transport thus Increase in expenses |
| G      | No effect |
| H      | Reasonable |
| I      | Increase in cost of production |
| J      | Very effective |
| K      | • Increase in operational costs  
     | • Timeous operations |
| L      | Very little effect |

Source: Primary Data

The respondents’ responses in Table 4.4 show that the majority of farmers had mixed responses. Farmers A, C, D, E, G and L, have concurrently experienced timely deliveries and delays from the current inbound transport system which has resulted either in efficient or stagnation of their operations depending on whether it’s on time or delayed respectively. The farmers stipulated timely deliveries are an added advantage because it results in reduction in expenses like operational costs.

The other two farmers (G and L) sighted that the transport system has no effect on their daily operations whilst only one (farmer B) highlighted that they have experienced increased operational costs due to distorted pricing.
On the contrary, farmers A, F, H, I, J and K use their own transport or third party transporters which has an impact on their operational costs. For example, farmer A, who sometimes uses third party transporters or farmer F who uses their own transport experience a hike in expenses whenever there is an increase in fuel prices.

**Question 4:** Please explain if you have encountered any feed, veterinary supplies or raw material (inbound) logistics challenges.

### Table 4.5 Challenges encountered in inbound logistics

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
</table>
| A      | • Bad roads  
         | • Delay in delivery by supplier citing fuel shortages  
         | • Breakdown of delivery trucks |
| B      | • Breakdown of trucks  
         | • Repairs of trucks not being done in time  
         | • Transport/ suppliers report fuel shortages |
| C      | • Trucks get stuck in mud during rainy seasons  
         | • Delay in delivery of inbound inputs by suppliers |
| D      | • Increase in cost |
| E      | • Uncontrolled transport cost  
         | • Breakdown of trucks |
| F      | • Fuel shortages  
         | • Exorbitant transport costs from transporters  
         | • Bad roads lead to wear and tear |
| G      | Increase in expenses |
| H      | Increase in costs |
| I      | • Increase in fuel price  
         | • Fuel shortage |
| J      | • Changes in prices |
| K      | • High transport charges from transporters  
         | • High fuel costs |
| L      | • Fuel shortages |

*Source: Primary Data*
The responses in Table 4.5 show that the major challenges affecting inbound logistics to dairy farmers (A to L) are all similar. The farmers sighted that the challenges that they face include bad road network, fuel shortages and exorbitant transport prices from transporters which sometimes results in delay in deliveries by suppliers. In addition to the challenges, they said that the end result which is delay in delivery has a negative impact on the farmers lead time and operational costs. This is in line with Stewart (2011) who highlights that the challenges that may hinder effectiveness in logistics include bad road infrastructure, traffic congestion, distance which may result in an increase in cost, climate changes, legislative challenges (funding disagreements and quarantine), technological challenges (additional costs, lack of integrated system, resistance to change and adjustment to technology), rising fuel prices and oversized shipments.

**Question 5:** If you have experienced challenges; how have you overcome them?

Table 4.6 How inbound logistics challenges have been dealt with

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
</table>
| A      | • Rehabilitation of roads using own labour and funds  
        | • Hiring of Third party transporters  
        | B      | • Use of own transport  
        | C      | • Engagement of local authority to rehabilitate the bad portions of the roads  
        |        | • Placement of orders in advance  
        | D      | • Importation of drugs from South Africa  
        |        | • Changing of feeding regime  
        | E      | Use of own transport  
        | F      | Buying of expensive fuel  
        | G      | • Use of feed reserves  
        |        | • Importation of some of the products  
        | H      | Trying new methods  
        | I      | Increase of selling price of milk to customers  
        | J      | Change of feeding regime  
        | K      | • Bulk purchasing as a group  
        |        | • Adaption to prices by increasing of selling price of milk to customers  
        | L      | • Provision of fuel to suppliers and is deducted from farmer’s bill  

*Source: Primary Data*

There were mixed responses in Table 4.6 from all of the farmers on how they have overcome the inbound logistics challenges they have faced and all their solutions had a huge impact on their operational costs and profits. The farmers elaborated that their solutions include
rehabilitation of roads close to their farm using own labour and funds (farmer A and B), hiring of third party transporters (farmer A and L), use of their own transport (farmer B, E and F) and changing of feed regime (D and J). Despite the different approaches used by the farmers, they all reported that their interim solutions resulted in timely delivery but resulted in a huge decline in profits as highlighted by some of the farmers, that is farmers A, B, E and F.

At the same, farmer K has resorted to bulk purchasing as a group with neighbouring farmers and the others increased the selling price to the customers (farmer I and K) which has improved the lead times of input deliveries and minimum impact on profits. This is the view of Nabhani and Shokri (2009) who suggest that by reducing lead time and achieving faster delivery, the company’s performance and competitiveness will be enhanced and that if goods are delivered late production may be stopped.

4.2.3 Section C: Outbound/Distribution Logistics

This section contains the questions regarding outbound logistics from dairy farmers to milk collection centres, processing companies and consumers. The basic objective of this section is to find the micro and macro factors that affect the outbound logistics network and if there is timely delivery. The section covers the following responses: milk delivery mode, distribution logistics challenges, how challenges have been dealt with and success rate in overcoming logistics challenges.
**Question 1:** Please explain how do you deliver your milk to the market?

**Table 4.7 Milk delivery mode**

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Milk collection trucks from processing company everyday</td>
</tr>
<tr>
<td>B</td>
<td>National Dairy Corp (NDC) trucks every other day</td>
</tr>
<tr>
<td>C</td>
<td>NDC trucks every other day</td>
</tr>
<tr>
<td>D</td>
<td>Use of scooter bike to milk collection centre to (MCC)</td>
</tr>
<tr>
<td>E</td>
<td>NDC trucks</td>
</tr>
<tr>
<td>F</td>
<td>Use of own transport to processor</td>
</tr>
<tr>
<td>G</td>
<td>Milk collection trucks from processing company</td>
</tr>
<tr>
<td>H</td>
<td>Use of own transport</td>
</tr>
<tr>
<td>I</td>
<td>Use of own transport</td>
</tr>
<tr>
<td>J</td>
<td>Milk collection trucks from processing company</td>
</tr>
<tr>
<td>K</td>
<td>Use of a neighbouring farmer’s vehicle</td>
</tr>
</tbody>
</table>
| L      | • NDC  
         • Trucks from processing company (Dairibord) |

*Source: Primary Data*

As shown in Table 4.7, 7 out of 12 farmers (farmers A, B, C, E, G, J and L) reported that their milk delivery mode is either by milk collection trucks from processing company on a daily basis or NDC trucks every other day. The farmers reported that processing company truck and NDC trucks collect milk in bulk from several farms and then deliver to the processing companies. This is in line Ruben (2006) who asserts that milk is a highly perishable product and must be processed within a couple of hours after production or should be kept at low temperatures at which it can be stored for 2 or 3 days before processing.

On the other hand, some farmers such as farmer D, F, H, I and K use their own transport to deliver milk to processing companies or to a milk collection centre.
Question 2: To what extent have you encountered any distribution logistics challenges?

Table 4.8 Distribution logistics challenges

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
</table>
| A      | • Collection truck is skipping days due to fuel shortages  
        | • Collection truck are now old and usually breakdown |
| B      | • NDC trucks are old and breakdowns are frequent |
| C      | • Fuel shortages resulting in truck skipping some days  
        | • Collection trucks get stuck during rainy season |
| D      | • Fuel shortages  
        | • Scooter breakdown |
| E      | • NDC trucks are old and breakdowns are frequent  
        | • Route assigned small truck result in delay or failure of collection |
| F      | • Exorbitant fuel prices  
        | • Fuel shortages |
| G      | None |
| H      | None so far |
| I      | Increase in fuel price and shortage |
| J      | None |
| K      | • Wear and tear of vehicle  
        | • High transportation charges  
        | • High fuel costs and shortages |
| L      | Bad road during rainy season |

Source: Primary Data

The responses in Table 4.8 reflect that the distribution logistics challenges that the farmers have experienced are similar and are common amongst all the farmers (A-L) that participated in the study. The challenges are: fuel shortages, wear and tear of vehicles, high transportation charges and break down of vehicles. The farmers reported that all these challenges result in an increase in transportation costs since most of the trucks are now very old and constantly require repairs. Thus, there are delays in the production cycle and an increase in expenses. This is supported
by Butler et al (2005), who says that an increase in transportation costs has an impact on production efficiency.

**Question 3**: What have you done at your dairy farm to counteract these challenges?

**Table 4.9 How outbound logistics challenges have been dealt with**

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Use of own transport to deliver milking cans to processor</td>
</tr>
<tr>
<td>B</td>
<td>• Lodged complaints with NDC</td>
</tr>
<tr>
<td></td>
<td>• Bought own pump at the farm</td>
</tr>
<tr>
<td>C</td>
<td>• Rehabilitation of muddy patches on roads prior to rainy season</td>
</tr>
<tr>
<td></td>
<td>• Installation of bulk storage and cooling tank on the farm</td>
</tr>
<tr>
<td>D</td>
<td>Use of a scotch cart driven by donkeys to deliver milk to MCC</td>
</tr>
<tr>
<td>E</td>
<td>Use of personal truck to deliver milk</td>
</tr>
<tr>
<td>F</td>
<td>Installation of a fuel storage tank</td>
</tr>
<tr>
<td>G</td>
<td>N/A</td>
</tr>
<tr>
<td>H</td>
<td>N/A</td>
</tr>
<tr>
<td>I</td>
<td>Increase of price of milk and products</td>
</tr>
<tr>
<td>J</td>
<td>N/A</td>
</tr>
<tr>
<td>K</td>
<td>Aggregation and delivery as a group</td>
</tr>
<tr>
<td>L</td>
<td>Own farm road repairs</td>
</tr>
</tbody>
</table>

*Source: Primary Data*

There were mixed responses from farmers in Table 4.9 on how they have counteracted distribution logistics challenges. For example, farmers A, D and E have resorted to using their own transport when the truck has broken down, whilst farmer F has installed a fuel storage tank on their farm in case of fuel shortages. On the other hand, farmer K has formed a group with other farmers so that they deliver using one vehicle to share fuel expenses. Lastly, only two farmers (C and L) reported that they are now repairing muddy patches on roads prior to rainy season.
Question 4: In line with your above responses, how do you rate the success of the measures put in place in overcoming the logistics challenge?

Table 5.0 Success rate in overcoming logistics challenges

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>It ensured delivery of milk in time but results in additional cost</td>
</tr>
<tr>
<td>B</td>
<td>NDC service delivery is improving but problems recur</td>
</tr>
<tr>
<td>C</td>
<td>Measures were effective because:</td>
</tr>
<tr>
<td></td>
<td>• Rehabilitation overcame logistics challenges</td>
</tr>
<tr>
<td></td>
<td>• Bulk tank resulted in reduction of losses</td>
</tr>
<tr>
<td>D</td>
<td>Not good solution</td>
</tr>
<tr>
<td>E</td>
<td>Good but cost of operations increased</td>
</tr>
<tr>
<td>F</td>
<td>Reduction on impact of fuel shortage</td>
</tr>
<tr>
<td>G</td>
<td>N/A</td>
</tr>
<tr>
<td>H</td>
<td>N/A</td>
</tr>
<tr>
<td>I</td>
<td>Partly successful but low profit margin</td>
</tr>
<tr>
<td>J</td>
<td>N/A</td>
</tr>
<tr>
<td>K</td>
<td>Reduction in transport costs</td>
</tr>
<tr>
<td>L</td>
<td>Very good</td>
</tr>
</tbody>
</table>

Source: Primary Data

The responses in Table 5.0 show that the success rate in overcoming outbound logistics by farmers in Mashonaland East was rated as good/partially successful by 8 out of 12 farmers. These farmers managed to achieve timely delivery of milk to customers/processors, reduction in transport costs and reduction of impact on fuel shortages but with low profit margins. This finding is in line with literature from Stock and Lambert (2001), which suggests that the improvement of the logistics activities was embarked upon with the purpose of decreasing production costs whilst increasing performance through improvement in the enterprises’ operations.
4.2.4 Section D: Road infrastructure

This section contains the questions regarding the current road infrastructure to dairy farms. The basic objective of this section is to find out if the road infrastructure has any impact on the logistics system. The section covers responses of the following: distance from milk collection centre (MCC)/processing company, condition of current road network, effect of road infrastructure on inbound logistics and interim recommended solutions.
### Table 5.1 Road infrastructure

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Distance from MCC/Processing company</th>
<th>Condition of current road network</th>
<th>Effect of road infrastructure on inbound logistics</th>
<th>Effect of road infrastructure on outbound logistics</th>
</tr>
</thead>
</table>
| A      | 59 kilometres                        | •39km is tarred and 20 km is dust road  
•Dust road is in a bad state | •Transporters charge exorbitant prices  
•Delay in deliveries | •Delay in delivery to customers  
•Delayed collection and delivery to milk processors |
| B      | 44 km                                | •Road network is tarred and dust road.  
•Dust road is in a bad state | •Wear and tear expenses are high  
•Trucks get stuck in rainy season | Trucks get stuck during rainy season |
| C      | 72 km                                | •Dust road in bad shape            | •Delay in deliveries of inputs                | Outbound trucks get stuck in mud                 |
| D      | 6 km                                  | Very bad                          | Costly if there is need of hired trucks       | Time lag from milking to the cold chain         |
| E      | 73 km                                | Tarred and bad dust road          | •Delay in deliveries                          | Delay in delivery                               |
| F      | 42                                    | •Tarred road 42 km  
•Dust road 18 km  
•Dust road in bad condition | Wear and tear of vehicles         | Wear and tear of vehicle                       |
| G      | 4.5 km                                | Bad road                          | Delay of delivery of inputs                   | Takes too long                                  |
| H      | 1 km                                  | Good                              | -                                             | -                                               |
| I      | 18 km                                 | •8km tarred  
•10km dust in poor condition | Wear and tear costs are high            | Wear and tear costs are high                    |
| J      | 50 km                                 | Fair                              | N/A                                           | N/A                                             |
| K      | 59 km                                 | Tar then extremely bad dust road  | •Increased cost of production  
•Wear and tear of vehicles | High transportation cost |
| L      | Harare collection radius 120 km       | Fair-needs attention              | Cuts of suppliers if in bad condition         | Delays will lead to milk quality deteriorating |

*Source: Primary Data*
As shown in Table 5.1, the distance to all the farms are in the range of six kilometres to seventy-three kilometres (6km - 73 km) to the nearest MCC or processing company. The majority of the farmers sighted that the condition of their current road network is composed of a good tarred road and an extremely bad dust road which impacts on their inbound and outbound logistics. They reported that the bad dust roads are worse during the rainy season and delivery trucks tend to get stuck in muddy potholes and roads which results in delay in deliveries. This is in line with a study done by AFDB (2011), in which Zimbabwe was estimated to have declined from 73% to around 60% of all roads between 1995 and 2009. They highlighted that most roads in the country are now not properly paved, and conditions of these roads worsen during the rainy season.

The farmers A to L sighted that the effect of road infrastructure on inbound and outbound logistics include: delay in deliveries, increase in transportation charges, increase in wear and tear expenses and trucks getting stuck in mud during the rainy season as shown in the Table 5.1.
Question 4: [If there are problems] what would you recommend to be the interim solution for your farm?

Table 5.2 Interim recommended solutions

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>• Road rehabilitation every year before rainy season</td>
</tr>
<tr>
<td></td>
<td>• Purchase of new trucks by processor</td>
</tr>
<tr>
<td>B</td>
<td>• Vigilant rehabilitation of dust roads</td>
</tr>
<tr>
<td></td>
<td>• Stability of the fuel supply sector</td>
</tr>
<tr>
<td>C</td>
<td>• Road rehabilitation in rainy season</td>
</tr>
<tr>
<td></td>
<td>• Stability of the fuel supply sector</td>
</tr>
<tr>
<td>D</td>
<td>• Road repair</td>
</tr>
<tr>
<td>E</td>
<td>• Road rehabilitation</td>
</tr>
<tr>
<td></td>
<td>• Purchase of new trucks</td>
</tr>
<tr>
<td>F</td>
<td>• Servicing of roads by local authority especially during rainy season</td>
</tr>
<tr>
<td>G</td>
<td>New road network</td>
</tr>
<tr>
<td>H</td>
<td>Resurfacing of road</td>
</tr>
<tr>
<td>I</td>
<td>Rehabilitation of roads</td>
</tr>
<tr>
<td>J</td>
<td>Upgrading the road</td>
</tr>
<tr>
<td>K</td>
<td>• Resurfacing of roads by local authorities</td>
</tr>
<tr>
<td></td>
<td>• Requirement for a satellite collection centre</td>
</tr>
<tr>
<td></td>
<td>• Processors need to avail vehicles for small scale farmers</td>
</tr>
<tr>
<td>L</td>
<td>• Hiring equipment for own farm road repairs</td>
</tr>
<tr>
<td></td>
<td>• Providing fuel to the district rural council road maintenance department</td>
</tr>
</tbody>
</table>

Source: Primary Data

As shown in table 5.2, all the farmers suggested rehabilitation of the road network as the recommended solution for them to achieve logistics effectiveness. This suggested solution is supported by the 2010 Zimbabwe Road Condition Survey which paints that only 34 percent of total classified roads are in fair or good condition and only 14 percent in good condition. The quality of paved/sealed roads is somewhat better than that of gravel and earth roads; nevertheless, a daunting 50 percent of classified paved roads are in poor condition and require costly rehabilitation.
Lastly, farmer K recommended that processing companies should avail milk collection trucks for small scale farmers to assist them to overcome outbound logistics challenges.

4.2.5 Section E: Information Technology

This section contains the questions regarding the use of information technology on dairy farms. The basic objective of this section is to find out if there is any use of information technology and if it has an impact on logistics on the dairy farms. This section covers the type of information technology (I.T) used on farm, success of I.T in logistics, I.T challenges and recommended solutions for technology challenges.
Table 5.3 Information Technology

<table>
<thead>
<tr>
<th>Farmer</th>
<th>Type of (I.T) used on farm</th>
<th>Success of I.T in logistics</th>
<th>I.T challenges</th>
<th>Recommended solutions</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>•Mobile phones for WhatsApp and phone calls •Computers</td>
<td>Timeous communication</td>
<td>None</td>
<td>Improvement of telecommunication infrastructure</td>
</tr>
<tr>
<td>B</td>
<td>•Mobile phones •Computers</td>
<td>Communication is now efficient</td>
<td>None</td>
<td>Improved of telecommunication infrastructure</td>
</tr>
<tr>
<td>C</td>
<td>•Mobile phones •Computers</td>
<td>Good</td>
<td>None</td>
<td>Boosting of network by telecommunication companies</td>
</tr>
<tr>
<td>D</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
<td>Require access to internet</td>
</tr>
<tr>
<td>E</td>
<td>•Mobile phones •Computers</td>
<td>Great tools</td>
<td>None</td>
<td>Improvement of connectivity in farming areas</td>
</tr>
<tr>
<td>F</td>
<td>Mobile phone</td>
<td>Communication is faster</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>G</td>
<td>None</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>H</td>
<td>Email and internet</td>
<td>Good</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>I</td>
<td>•Mobile phones •Laptop</td>
<td>Communication is now easy</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>J</td>
<td>Use of internet</td>
<td>Access to information</td>
<td>None</td>
<td>Network availability at all time</td>
</tr>
<tr>
<td>K</td>
<td>Mobile phone</td>
<td>Communication is faster</td>
<td>None</td>
<td>None</td>
</tr>
<tr>
<td>L</td>
<td>•Internet •Cell phones</td>
<td>Ensures real time tracking of goods in transit</td>
<td>Less work by staff during – occupied by social media during work</td>
<td>Limit use during productive hours</td>
</tr>
</tbody>
</table>

Source: Primary Data

The responses in Table 5.3 above show that the majority, 10 out of 12, of the dairy farmers have embraced technology and makes use of mobile phones and computers to communicate with their suppliers and processing companies. They said they mostly utilize social media, emails and for research purposes.
The farmers sighted that the information technology has improved their communication with suppliers and vice versa. They said that with the introduction of technology; communication is now efficient, easy, faster and just-in-time. The comments of the farmers on the success of I.T is supported by Laudon and Laudon (2014), who says that information systems have contributed to the establishing of supply chain management systems which link suppliers to the buyer thus promoting supplier intimacy.

Also, 11 out of 12 farmers highlighted that they have not faced any information technology challenges and their recommended solution for them to use I.T more often is for the telecommunication companies to improve their infrastructure so that connectivity in farming areas improves.

Lastly, only one farmer reported that the challenge they have experienced on their farm is that their workers are now performing less work because they are always on social media. Their recommended solution to this problem is to limit the use of mobile phones during production hours.

4.3 Summary of Findings

The study was aimed at investigating the effectiveness of logistics in the dairy farming value chain in Zimbabwe; Case Study of Mashonaland East.

4.3.1 Impact of inbound logistics in dairy farming

The research found that the responsiveness of suppliers is generally good but the inbound logistics effectiveness is affected by the current bad road network which has a negative impact on the delivery trucks and transport costs.

4.3.2 Impact of outbound logistics in dairy farming

Another significant finding was that the farmers mainly deliver milk using milk collection trucks from processing companies and use of own transport but the outbound logistics
effectiveness is affected by the current bad road network which has an negative impact on the delivery trucks efficiency and transport costs.

4.3.3 Impact of road infrastructure on logistics in dairy farming

The research also found that the road infrastructure has a negative impact on the effectiveness of logistics in Mashonaland East. The bad road infrastructure has an adverse effect on the lead time of deliveries and the condition of the milk collection trucks.

4.3.4 Impact of information technology in logistics on dairy farms

Lastly, the research found that all the farmers do not have any logistics system that assists them with their daily logistics endeavours. The farmers only use mobile phones and emails to communicate with their suppliers.

4.4 Conclusion

The aim of chapter 4 was to report on the findings and results of the study and to discuss them, taking note of their implications and to link them to the literature. The next chapter will cover the conclusions deduced from the research, recommendations that are done based on the findings, the limitations of the study and recommended areas for further research.
Chapter 5: CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter makes extrapolations of the findings from Chapter 4, making the essential conclusions and recommendations. This chapter also explains the extent to which this dissertation satisfied the objectives and aims that had been set at the commencement of the research study. Chapter 5 will also reflect on the areas for further study and the limitations of the research.

5.2 Conclusions

The overall conclusion drawn from this study is that the inbound and outbound logistics in dairy farming sector in Mashonaland East is not effective because of poor road infrastructure, but there are also other areas that need improvement, as evidenced by the following conclusions to the research objectives

5.2.1 Impact of inbound logistics in dairy farming

5.2.1.1 Objective
To assess the challenges that affect the success and failure of the inbound logistics component in dairy farming.

5.2.1.2 Finding
The research found that the challenges that affect the success of inbound logistics are rate of responsiveness of suppliers, size of order, cost of hiring third party transporters and supply of fuel.

5.2.1.3 Conclusion
The study concludes that the inbound logistics challenges are similar for all dairy farmers but are more pronounced for small scale farmers because of the size of their orders.
5.2.2 Impact of outbound logistics in dairy farming

5.2.2.1 Objective
To analyse the challenges that impact the success and failure of outbound logistics in dairy farming.

5.2.2.2 Finding
The study found that the challenges that impact the success of outbound logistics are quantity of milk being delivered to processing company or milk collection centre, frequency of delivery of milk, current road infrastructure, the condition of milk collection trucks and price and supply of fuel.

5.2.2.3 Conclusion
The research concludes that the dairy farmers in Mashonaland East face almost similar challenges in outbound logistics but they are more conspicuous for small scale farmers because of the small quantity of milk they supply.

5.2.3 Impact of road infrastructure on logistics in dairy farming

5.2.3.1 Objective
To assess the impact of road infrastructure on logistics in dairy farming.

5.2.3.2 Finding
The research found out the road infrastructure has an impact on the effectiveness of logistics in Mashonaland East. The bad road infrastructure has resulted in the increase in lead time of deliveries, deterioration of the condition of the milk collection trucks and farmer’s personal vehicles and an increase in prices being charged by third party transporters.

5.2.3.3 Conclusion
The road infrastructure reflects the depression and lack of investment in the Zimbabwean economy.
5.2.4 Impact of information technology in logistics on dairy farms

5.2.4.1 Objective
To find out the role and scope of information technology in logistics on dairy farms.

5.2.4.2 Finding
Lastly, the research found that most of the farmers use some form of technology to communicate with suppliers but they do not use any logistics information systems on their farms. The farmers only use mobile phones and emails to communicate with their suppliers.

5.2.4.3 Conclusion
Finally, the study concludes that, probably because of the scarcity of foreign currency, Zimbabwean dairy farmers have yet to embrace logistics software which is now commonly used in many parts of the world.

5.3 Evaluation of Research Proposition
The proposition is partially confirmed because the road infrastructure in Mashonaland East has had a negative impact on the effectiveness of logistics.

5.4 Recommendations
5.4.1 Maximise use of horizontal cooperation by farmers
The farmers should consider setting up logistics systems that will be developed by cooperative societies, which have several milk collection points, thus resulting in more effective organisation of milk collection, bulk purchasing for those with small orders and sharing of transporter costs.
5.4.2 Setting up of logistics information systems in the dairy industry
The dairy industry is recommended to set up a logistics system such as the Geographical Information System (GIS) which is gaining some popularity in the dairy industry where it can be functional in various key areas such as asset management, mapping, vehicle tracking, facility siting and network analysis. A GIS system will enable the dairy to use short and cheaper routes during the milk collection, with high rate of return within a short period, a decision that the traditional methods of handling data are incapable of providing. The dairy can therefore save time, mileage and labour.

5.4.3 Revision of current policies in the dairy industry
The policies on dairy development need to be revised to create a favourable environment for small holder dairy expansion. Farmers need support to meet market, registration and certification standards that can link them to sustainable markets.

5.5 Study Limitations and Recommendations for Further Research

The study was a single case design of dairy farmers located in Mashonaland East. Further research in this area should be a multiple case design involving several dairy farmers in different provinces in Zimbabwe to ensure replication logic. There is also a need for a research that also considers the impact of information technology in dairy farming on organisation’s performance.

The research shows that there are other factors that can moderate or affect the effectiveness of logistics in the dairy farming value chain. These factors can therefore, be studied to assist the dairy industry to formulate a logistics strategy which will reduce the operations cost and increase profit margins.
References


15. Dairy Services Unit (DSU), (2009)


38. Langkos S, (2014), Athens as an international tourism destination: An empirical investigation to the city's imagery and the role of local DMO's, University of Derby


40. Liehr P and Smith M.J, (1999), Middle range theory: Spinning research and practice to create knowledge for the new millennium, Advances in Nursing Science, 21(4), pages 81-91


49. Minnich D and Maier F.H, (2006), Supply Chain Responsiveness and Efficiency-Complementing or Contradicting Each Other? International University in Germany, page 1-16


76. SNV, (2012), Evaluation of smallholder dairy programmes in Zimbabwe, Accessed 3 September 2018,


89. Yigitcanlar T., (12 May 2017), Open Innovation in Value Chain for Sustainability of Firms, Sustainability, 9(811), pages 1-8


91. Zimbabwe Dairy Industry Trust (ZDIT), (2017), Department of Veterinary Services in Zimbabwe
APPENDIX 1

Questionnaire for Dairy Farmers

TOPIC: The effectiveness of logistics in the dairy farming value chain in Zimbabwe: The Case of Dairy Farms in Mashonaland East

Section A: Demographic & Background Information:

1. Age?  
   - 25-30
   - 31-40
   - 41-45
   - 46-50
   - Above 50

2. Gender?  
   - Male
   - Female

3. How long have you worked in the dairy farming sector?  
   - Below 5 years
   - 6-10
   - 11-15
   - 16-20
   - 21-30
   - +30 Years

4. What are your key tasks and responsibilities?  
   - ………………………………………………………………………………………………………………………………
   - ………………………………………………………………………………………………………………………………
   - ………………………………………………………………………………………………………………………………

Section B: Inbound / Procurement Logistics

Question 1: What is the degree of responsiveness from your suppliers when you place an order?

……………………………………………………………………………………………………………………………………
Question 2: Please explain how your inputs are brought to the farm?

Question 3: What has been the effect of this transport system on your dairy farm operations?

Question 4: Please explain if you have encountered any feed, veterinary supplies or raw material (inbound) logistics challenges.

Question 5: If you have experienced challenges; how have you overcome them?

Section C: Outbound/Distribution Logistics

Question 1: Please explain how do you deliver your milk to the market.

Question 2: To what extent have you encountered any distribution logistics challenges?
**Question 3**: What have you done at your dairy farm done to counteract these challenges?

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......................................................................................................................................................
......................................................................................................................................................

**Question 4**: In line with your above responses, how do you rate the success of the measures put in place in overcoming the logistics challenge?

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......................................................................................................................................................

**Section D: Road infrastructure**

**Question 1**: How far are you from any milk collection centre/ processing company?

......................................................................................................................................................

**Question 2**: Describe the condition of the current road network system that leads to your farm.

......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................

**Question 3**: What effect does the road infrastructure have on:

(a) The transportation of inputs to the farm?

......................................................................................................................................................
......................................................................................................................................................

(b) The delivery of milk to customers?

......................................................................................................................................................
......................................................................................................................................................
......................................................................................................................................................

**Question 4**: [If there are problems] what would you recommend to be the interim solution for your farm?
Section E: Information Technology

Information technology in this case refers to the use of systems (especially computers and telecommunications) for storing, retrieving, and sending information on a daily basis on the dairy farm.

Question 1: Please explain if you use any information technology on your farm?

Question 2: How do you rate the success of information technology in overcoming logistics challenges?

Question 3: To what extent has the advancement of information technology created any additional challenges at your farm?
Question 4: If there are challenges, what would you recommend as solutions?

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......................................................................................................................................................

End of Questionnaire.

THANK YOU FOR YOUR VALUABLE TIME AND SUPPORT!