Enhancing Supply Chain Performance through Collaborative Planning Forecasting and Replenishment Model:

The Case of Ethiopian Dairy Industry

A Thesis Submitted to the School of Graduate Studies of Addis Ababa University as a Partial Fulfillment for the Degree of Masters of Science in Mechanical Engineering (Industrial Engineering Stream)

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Declaration

I, the undersigned, hereby declare that the work which is being presented in this thesis entitled Enhancing Supply Chain Performance through Collaborative Planning, Forecasting and Replenishment Model: The Case of Ethiopian Dairy Industry is original work of my own, has not been presented in any of other university and that all sources of material used for the thesis have been duly acknowledged.

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This is to certify that the above declaration made by the candidate is correct to the best of my knowledge.

Confirmed by: **Mengist Hailemariam (PhD)** Signature: _____ Date_____

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Place and Date of Submission**: Addis Ababa University Institute of Technology, June 2016.**

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Abstract

In today's competitive market, the competitions between individual enterprises transformed in to competition between their supply chains which emerged as the biggest differentiating factor between a successful and unsuccessful business. The goal of SCM is to meet the needs of customer by supplying the right product at the right place, time, and price. Therefore in order to meet the customers need, all the actors in the chain should work together collaboratively for similar goal.

Ethiopia has the second largest livestock population in Africa and the contribution of livestock and livestock product to the agricultural economy is significant. But the livestock sector in general and the dairy sub sector in particular are not developed in the expected level because of many problems in the sector such as: poor collaboration and integration throughout the chain, week information sharing practices, unfair market competition, low milk productivity level, poor infrastructure on potential milk producing area.

Therefore, the main objective of this thesis is identifying the existing supply chain related problem of the dairy processing industry /i.e. shortage and poor quality of raw milk supply, unbalanced demand & supply, poor collaboration & information sharing practices throughout the chain/, evaluate & analyzing the performance of their supply chain in terms of information sharing, on time delivery, flexibility, decision synchronization, resource planning, cost reduction and customer satisfaction by taking twelve sample dairy industries and adapting collaborative planning forecasting and replenishment model which is used to improve the chains performance.

The final result is, if the dairy industry adapted the collaborative planning, forecasting & replenishment method, they can solve most of the problems which affects their supply chain and improve the performance.

Key words: Supply Chain Collaboration, CPFR, Ethiopian Dairy Industry SC, Lame Dairy PLC.

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Acronyms

CPFR - Collaborative Planning, Forecasting and Replenishment

EDI - Electronic Data Interchange

ERC - Efficient Consumer Response

GSCF - Global Supply Chain Forum

POS - Point of sale

SC - Supply Chain

SCC - Supply Chain Collaboration

SCM - Supply Chain Management

SCOR - Supply Chain Operation Reference

USA - United States of America

VICS - Voluntary Inter-Industry Commerce Standards

VMI - Vendor Managed Inventory

CHAPTER ONE

Introduction

1.1 Background of the Study

Milk and dairy products play a key role in healthy human nutrition and development throughout life, especially in childhood. Billions of people around the world consume milk and dairy products every day. Not only milk and dairy products are a vital source of nutrition for these people, they also present livelihoods opportunities for farmers, processors, shopkeepers and other stakeholders in the dairy value chain.

As per FAO, (2010) studies on Status and Prospects of global milk Production, It is estimated that, throughout the world, almost 150 million farm households are engaged in milk production, the majority of them are in developing countries where annual growth rates in milk consumption averaged 3.5% to 4.0%. In the past, increases in global milk demand have been mainly driven by population growth, whereas now a days they are increasingly also fuelled by rising per capita milk consumption in some highly populated developing countries. Increasing income levels are expected to raise the demand for milk and dairy products by more than 1.8% per annum (FAO, 2010).

Ethiopia has the second largest livestock populations in Africa and the contribution of livestock and livestock products to the agricultural economy is significant. But the livestock sector in general and the dairy sector in particular do not provide the expected contribution to the national income. The development of the dairy sector in the country is hindered by a number of technical, institutional and socio-economic constraints.

Dairy production system in Ethiopia is practiced by involving a vast number of small scale, medium scale and large scale farms (YONAD, 2009). Milk consumption in the country is around 19 kg of milk per year which is very low as compared to the world average and other neighboring countries (FAO, 2010). Rapid increasing population size with a growing urbanization is resulting in a growing demand for dairy products. The growth in milk production estimated to be 1,089,488,251 liters per year, which does not meet even the domestic demand for dairy products (Eyassu, Reiner, 2014). To bridge the gap between supply and demand the country imports large volume of dairy products per annum.

In order to improve the problem of being unable to be competent in market & technology, quality problem, poor supply chain integration and collaboration, low performance, the concept of supply chain performance evaluation is important. One means of improving the performance of supply chain system is creating collaborative planning, forecasting and replenishment method throughout the chain.

The purpose of this thesis is two folds. First, the performance of Ethiopian dairy industry supply chain system is poor, ineffective and inefficient; due to this the sector is not developed and the country is not benefiting from its resource, hence, the need for the study. Second, different Supply chain studies were conducted in different sectors such as textile, leathers, tannery, pharmaceutical, footwear, forest and bottling industries, but not for the dairy industries. Hence, there is literature gap to be partially filled. Therefore, this study identifies supply chain related problems, analyze the dairy industry performance and suggest a scheme to improve through collaborative planning, forecasting and replenishment model which helps to address the current problems that are impending the sector's efficiency and productivity.

1.2 Statement of the Problem

Even though Ethiopia is the second largest livestock populations in Africa, the livestock sector in general and the dairy subsectors in particular do not make a substantial contribution to the national income and are not developed to the expected level. In different studies (TAM Consult 2008, YONAD 2009, Zelalem, Emma2 nnuelle & Ameha 2011, AGP 2013, Eyassu & Reiner 2014, et al) researchers identified different challenges and problems which hinder the sector not to be developed. This study focused on the following problems which affects the dairy processing industry supply chain performance:

- **Shortage of Raw Milk Supply:** - There is a shortage of raw milk supply because of which most of the dairy processing industries are operating under their processing capacity (around 40% to 50%). On the contrary from the total produced milk only 5 to 7% are supplied to the market (Zelalem, Emmannuelle and Ameha, 2011). This indicates that there is a gap on working collaboratively between the dairy processing industry and the raw milk producers and supplier.

- **Poor Quality of Raw Milk Supply: -** Poor quality of raw milk is supplied to processors because of unhygienic processing methods before supply, adulteration which is mostly done by farmers and brokers when collecting & marketing the milk and delays in collecting milk from the farmers to the processing industries. Since the suppliers and the processing companies are not working in collaboration, each of them are focusing on their individual advantages and benefits, there by highly affecting the performance of the whole chain.
- **Seasonal Nature of Demand and Supply: -** Demand of milk and milk products are seasonal because of fasting time. Since most of the Ethiopian dairy processing companies mainly produce short shelf life product /like pasteurized milk & yogurt/, the production volume goes down during the fasting period. In addition to this, surplus amount of milk supplies in fasting period due to low home consumption and the reverse during no fasting time the milk supply decrease due to high home consumption.

All these problems facing the Ethiopian dairy industry point towards lack of supply chain integration and collaboration. Therefore, the purpose of this study is to investigate the supply chain and propose supply chain management tools & systems which improve the chains performance. This will have a very significant value for the development of the dairy industry as well as for the sector.

1.3 Objective

The main objective of this thesis is, evaluate & analyze the existing supply chain performance of Ethiopian dairy industries and adapting collaborative planning, forecasting & replenishment model to improve the supply chain performance.

1.3.1 Specific Objectives

The specific objectives of this study are:

- Identify supply chain related problems of the Ethiopian dairy industry,
- Conduct the analysis and evaluation of the existing performance of the supply chain,
- Develop CPFR model which improvement the performance of dairy industry SCM.

1.4 Basic Research Questions

To solve the stated problems and improve Ethiopian Dairy Industry supply chain, this research answered the following basic research questions.

1. What are the challenges of Ethiopian dairy industry supply chain?
2. How can one improve the performance of the supply chain?

1.5 Significance of the Study

The aim of this thesis is to identify supply chain problems and challenges that hinder the comprehensiveness of the Ethiopian dairy industries and adapting collaborative planning, forecasting & replenishment model which is used to improve the chains performance. Therefore the following are beneficiaries from this study

- The sector as a whole and the dairy industry
- The case company
- Academician who want to work the area.

1.6 Scope of the Study

The scope of this thesis work is identifying supply chain related problems of Ethiopian dairy industry; analyzing & evaluating the existing supply chain performance and propose a collaborative supply chain tools which is used to improve the performance.

1.7 Methodology

In order to achieve the stated objective of the study the following methodologies are used.

Literature Review: Broad reviews of different literatures from different sources on the subject matter were used to do the research. Different books, journals and websites are referred as a source of literature regarding on supply chain management, performance improvement in SCM, Ethiopian dairy sector supply chain and CPFR model.

Data Collection: Data were collected by using primary and secondary data collection system. Primary data were collected through interviews and questioners. Secondary data were collected from reports, researches and journals published in the study area.

Data Analysis: After raw data is collected on the existing supply chain performance of Ethiopian dairy industry, properly analyzed quantitatively and qualitatively in detail.

Development of Model: The CPFR model adapted for Ethiopian dairy processing industry in order to improve their poor collaboration and information sharing practices.

Conclusion & Recommendation: Finally conclusion and recommendation is forwarded.

Diagrammatically the general methodology employed for the study of this thesis is showed as follows below figure 1.1.

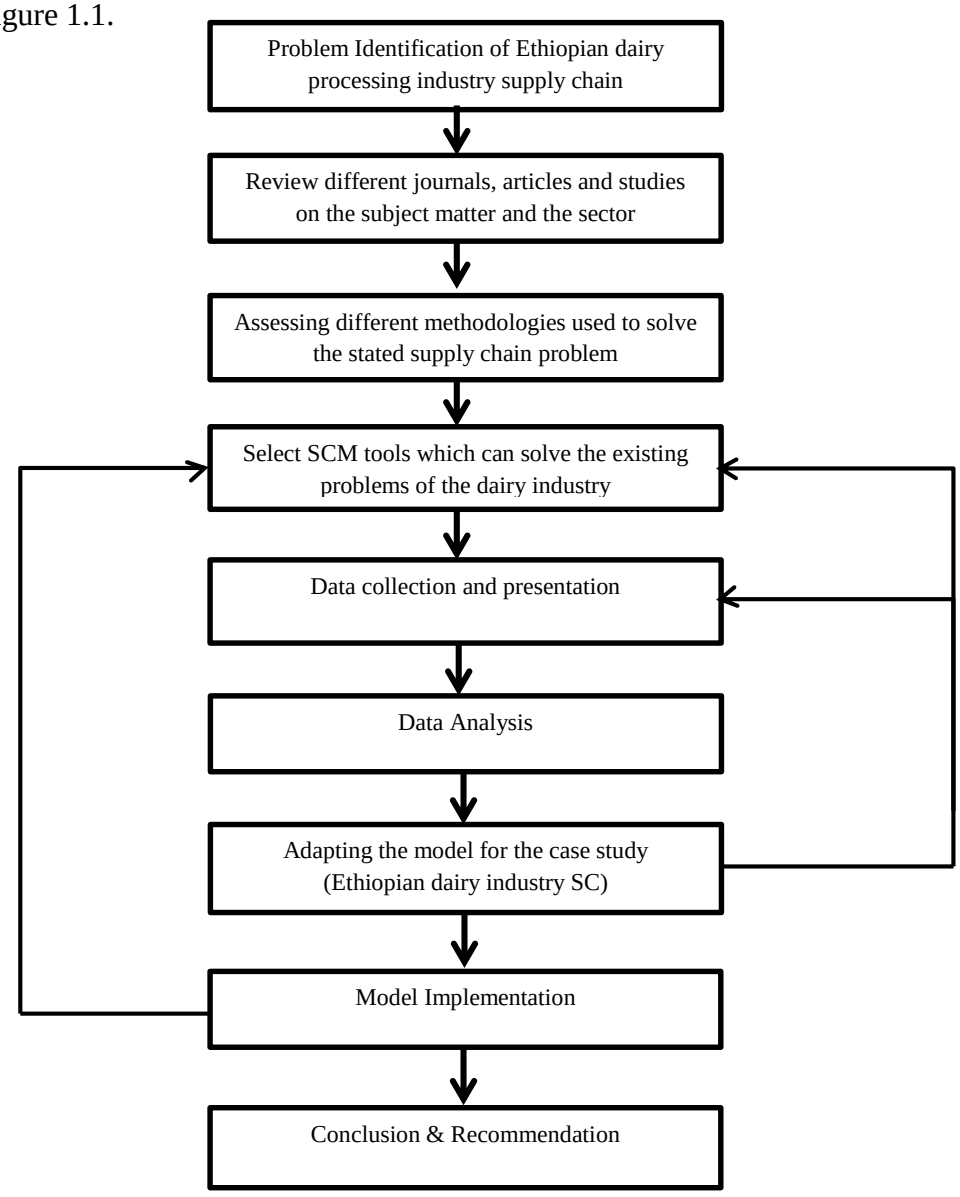


Figure 1.1 Methodology implemented for the study

1.8 Organization of the Study

The thesis is organized in seven chapters. The first chapter begins with an introduction part and includes background of the study, statement of the problem, objectives, significance and scope of the study. The second chapter contains literature review on supply chain management, supply chain collaboration with performance measurements and CPFR model. The third chapters cover the overviews of Ethiopian dairy sector. The fourth chapter contains the data collection, data presentation and a detail analysis part. Chapter five is about developing CPFR model for Ethiopian dairy industry supply chain. Chapter six contains the application of the model in one specific case company in order to validate the CPFR model feasibility. Finally, the last chapter seven is all about the conclusion and recommendation of the researcher.

CHAPTER 2
Literature Review

2.1 Supply Chain Management

Today Supply chain management has become a universal approach to cost effectiveness, timely delivery and the creation of growth-oriented exchange system in goods and service. Different authors define supply chain in various ways. Among these some of them are:

- Mentzer, Dewitt, Keebler, Min, Nix, Smith, and Zacharia (2001) defines supply chain: is a network of connected and interdependent organizations mutually and cooperatively working together to control manage and improve the flow of material and information from suppliers to end users i.e. series of integrated enterprises that share information and coordinate smooth flow of goods, services.[Mentzer, Dewitt, Keebler, Min, Nix, Smith, and Zacharia: Defining Supply Chain Management, Journal of Business Logistics, vol.22, no. 2, 2001]
- Houlihan (1985), Stevens (1989), Lee and Billington (1993), Lamming (1996) define supply chain as: is a system of suppliers, manufacturers, distributors, retailers, and customers where materials flow downstream from suppliers to customers, and information flows in both directions.
- A supply chain may be defined as an integrated process where in a number of various business entities (i.e., suppliers, manufacturers, distributors, and customer) work together in an effort to: Acquire raw materials, Convert these raw materials into specified final products, and Deliver these final products to customer.

2.1.1 Terms and frame works used in Supply Chain Management

In supply chain management, different researchers stated different frameworks and terms commonly used. For this study only reviewed four major frame works, i.e. supply chain operation reference (SCOR) model, Global supply chain forum (GSCF), CPFR & the Mentzer frameworks of supply chain management and three main supply chain terms i.e. collaboration, integration and sustainability.

Table 2.1 Frameworks and Terms used in SCM

Frameworks which is used in SCM	Description	Advantage	Authoress
SCOR	▪ Is a high level planning process, which balances aggregate demand and supply to develop a course of action that best meets the requirements of the source, make, and deliver processes ▪ Have five core business processes – plan, source, make, deliver and return.	▪ SCOR is used to identify measure, reorganize and improve supply chain processes through a cyclical process that includes: Capturing the configuration of a SC, measuring the performance of the SC, comparing against internal & external industry goals, Re-aligning SC processes and best practices to fulfill unachieved or changing business objectives.	▪ Lambert et al. 2005 ▪ Supply Chain Council, 2009
GSCF	▪ The GSCF framework is deal on the importance of utilizing a process focus, where all functions that touch a product or are involved in its service delivery must work together. ▪ It consist eight key business processes i.e. Customer Relationship Management, Customer Service Management, Demand Management, Order Fulfillment, Manufacturing Flow Management, Supplier Relationship Management, Product Development & Commercialization and Return Management which is the ▪ Foundation for supply chain management	▪ The GSCF helps companies to structure fundamental relationships during implementing the customer relationship management and supplier relationship management processes ▪ It also used to have companies effective and efficient supply chain by creating proper coordination mechanisms across the various functions.	▪ Lambert et al. 1998 ▪ Lambert et al. 2005

CPFR	▪ CPFR is a supply chain management tool which incorporating planning, forecasting and replenishment under a single frame work that aims to enhance supply chain visibility by reducing any variance b/n supply and demand.	▪ Reduce inventory levels ▪ Increase efficiency of replenishment ▪ Increase sales ▪ Increase customer service	VICS, 1998, 2005
The Mentzer Framework	▪ SCM involves multiple firms and multiple business activities, as well as process orientation to coordinate activities across functions and across firms within the supply chain. ▪ In this framework, the supply chain is presented as a pipeline, illustrating the supply chain flows, the inter-functional coordination of traditional business functions, and the inter-corporate coordination between supply chain partners from the supplier's suppliers through the customer's customer.	▪ Used to improve the long term performance of the individual companies and the supply chain as a whole	Mentzer et al. 2001
Collaboration	▪ Collaboration is a cooperative relationship built on developing synergies within and across company boundaries that help all supply chain partners. ▪ Is the means by which companies with the supply chain work together towards mutual objectives through the sharing of ideas, information, knowledge, risk and rewards ▪ The objective of a collaborative in SC	▪ Synchronized supply chain, improve customer service, lower costs, and higher profits ▪ Improve flexibility, better utilization of resources, shortened as well as improved control of delays, and increased quality and development of competency, ▪ Reduced uncertainty by creating a transparent, visible demand pattern upstream in the supply	Cohen (2004), Angerhofer & Angelides (2006), (Holweg et al. 2005

	is to gain competitive advantage by improving the chain's overall performance through a holistic approach, rather than by improving each link independently	chain. Relevant and reliable information available on the demand side can lower supply chain risks and simplify management and control of supplier processes.	
Integration	▪ Integration is the alignment and interlinking of business processes, and embodies various communication channels and linkages within a supply network ▪ supply chain integration is enhance total process efficiency and effectiveness across members of the supply chain ▪ In supply chain integration the involved parties act as one entity within an extended enterprise	▪ Create high network's ability to design products faster, with higher quality and lower costs as compared to a single company. ▪ Add expertise and information regarding new ideas and technologies into each partner's system. ▪ Help to identify problems as well as solutions ahead of time, facilitate outsourcing, and reduce the internal complexity of various projects. ▪ Improve communication and information exchange between companies. ▪ Reduce rework and overall project costs.	Lambert et al. 1998 Wen et al. 2007 Ragatz et al. (2002)
Sustainability	• Sustainability in SC is, the strategic, transparent integration and achievement of an organization's social, environmental, and economic goals in the systematic coordination of key inter-organizational business processes for improving the long-term economic performance of the individual company and its SC.	It simultaneously considers and balances economic, environmental, and social goals in the chain.	Carter and Rogers (2008)

2.2 Supply Chain Collaboration

Supply chain collaboration is defined as "two or more chain members working together to create a competitive advantage through sharing information, making joint decisions, and sharing benefits which result from greater profitability of satisfying end customer needs than acting alone" (Simatupang & Sridharan, 2005; Whipple & Russell, 2007).

Supply chain collaboration provides benefits to the chain member; it can improve customer responses, reduce bullwhip effect by creating a transparent, visible demand & supply pattern upstream in the supply chain, improve flexibility, better utilization of resources, shortened as well as improved control of delays, and increase quality & development of competency and elevate capabilities much better than ever. In addition, they can share knowledge with each other. That is why SCC has become one of the most talked about topics in business area (Min et al., 2005). Especially in today's complex competition business environment, collaboration is the driving force behind effective supply chain management. The following figure below shows the evolution of supply chain collaboration (Mohsen A. & Sharmin A., 2007).

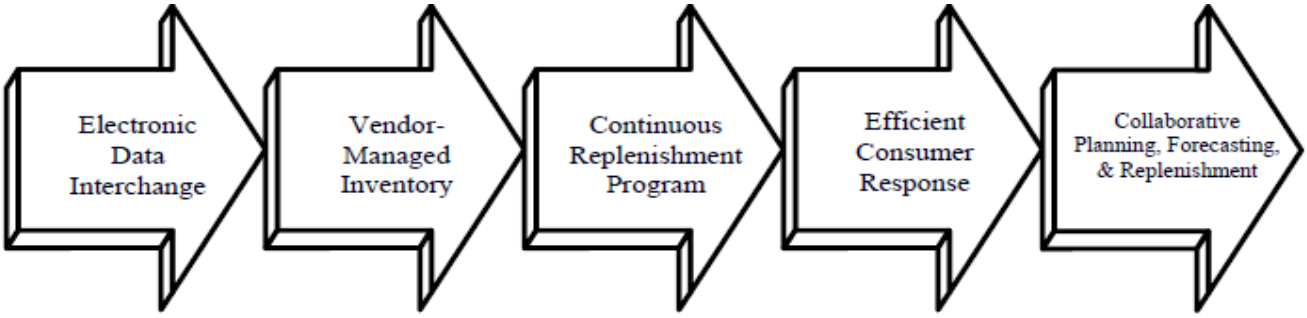


Figure 2.1 Evolution of Supply Chain Collaboration

Electronic Data Interchange (EDI): has been used to transmit information such as purchase orders, invoices, material releases, shipping notices and product inquiries electronically. To use this technology you had to be tied to traditional client/server technology. EDI based transactional relationships have grown dramatically over the last decade. What makes things different today is the Internet. There is no need for traditional client/server technology; you just need a Web browser. Product information can be called up from an on-line catalogue and ordering can be done by sending e-mail. The use of EDI facilitates business transactions,

eliminates paperwork, and reduces costs, but has negligible impact on supply chain planning and scheduling.

Vendor-Managed Inventory (VMI): was introduced by Kurt Solomon Associates in 1992. VMI existed in retailing before the growth of enabling technologies and is perhaps the most widely known system for managing supply chains. In this practice, the replenishment decision for all retailers is centralized at the upstream distributor or manufacturer. The manufacturer or distributor manages and monitors inventories of the wholesaler or retailer.

Continuous Replenishment Programs (CRP): are driven by actual withdrawals of inventory from a retailer warehouse rather than Point-of-Sale data at the retailer level. In CRP, the manufacturer or wholesaler replenishes a retailer regularly based on POS data.

Efficient Consumer Response (ECR): is driven by the establishment of "Effective Channel Relationships," whereby partners in the supply chain cooperate to achieve the more than $30 billion savings promised by the ECR initial analysis conducted by industry-wide working groups in 1992. The analysis determined that the industry could save $30 billion annually and reduces system-wide inventories by more than 40 percent by improving practices in the four areas of replenishment, product assortment, trade promotion, and new product introductions. While all four areas are important, the replenishment issue has absorbed much of the attention of the participants

Collaborative Planning, Forecasting, and, Replenishment (CPFR): extents Vendor Managed Inventory principles and is considered to be the latest stage in the evolution of supply chain collaboration. Older supply chain initiatives had gaps in their practices. In many of these operations financial plans took precedence over forecast, resulting in high inventory levels, lower order fill rates, and increased expedited activities. Collaborative planning, forecasting and replenishment is a set of business processes that help eliminate supply/demand uncertainty through improved communications/collaborations between supply chain trading partners.

CPFR is considered to be the latest strategy in the evolution of supply chain collaboration. Some of the earlier collaboration strategies like CRP and VMI focused on inventory replenishment activities and did not consider the importance of demand forecasting and production planning activities. However, CPFR is a comprehensive collaboration strategy that provides an excellent opportunity for both the customer and the supplier to be involved in demand forecasting and inventory replenishment planning activities.

2.3 Collaborative Planning, Forecasting and Replenishment /CPFR/

In contrast to the traditional business paradigm that focuses on the effectiveness and efficiency of separate business functions, a growing number of firms have begun to realize the strategic benefits of jointly planning, controlling and designing a supply chain as a whole through inter-functional and inter-organizational integration. These benefits include: reduced inventory (or working capital), less frequent rush delivery, faster product flow, quicker customer response time, higher asset utilization, larger marker share, increased revenue and profit.

A lack of success in implementing supply chain collaboration is often due to poorly coordinated data exchange or information sharing among supply chain partners. Thus, the ultimate success of supply chain integration will depend on supply chain partners' willingness to share real-time information throughout the supply chain and develop joint planning processes for adding value to end-customers' needs. (Raghunathan, 1999; Cachon and Fisher, 2000; Lee et al., 2000; Thonemann, 2002; Zhao et al., 2002 a, b for various benefits of sharing information in SC).

CPFR is supply chain management tool which incorporating planning, forecasting and replenishment under a single framework that aims to enhance supply chain visibility by reducing any variance between supply & demand, improving order forecasts and fulfillment through continuous communications among multiple supply chain partners (Fliedner, 2003). It brings mutual benefits to all the supply chain partners involved by utilizing more interactive, broader communication processes throughout the supply chain rather than relying on limited transaction-level.

Benefits of CPFR are: higher inventory turnover, lower stock-out rate, improved order fill rate, improved cash flow; more accurate production scheduling, more amicable business relationships among supply chain partners, reduced cycle time, reduced order picking/receiving costs, reduced labor costs, and quicker response to customer needs (Sherman, 1998; Williams 1999; Barratt and Oliveira, 2001; Langabeer and Stoughton, 2001; McKaige, 2001; McCarthy and Golicic, 2002; Andraski and Haedicke, 200).

As mentioned in the above, CPFR provides many valuable benefits for manufacturer and also for retailers. These includes (AMR Research, 2001)

Table 2.2 Importance of CPFR for manufacturer and retailer

Importance of CPFR		
S/No	**For manufacturer**	**For retailer**
1	Reduce inventory levels by 10% to 40% percent, on average	Improve store shelf stock rate by 2% to 8% on average
2	Increase the efficiency of their replenishment cycles by 12% to 30%, on average	Decrease in inventory levels by 10% to 40%, on average.
3	Increase their sales by 2% to 10% on average	Increase in sales by 5% to 20%.
4	Increase their customer service ratings by 5% to 10%, on average.	Decrease logistic cost by 3% to 4% on average

The focus of CPFR is wider and its objectives are more ambitious. The differences between supply chain without CPFR and with CPFR are explained in the following table below.

Table 2.3 Impact of CPFR on SCM

Supply chain without CPFR	**Supply chain with CPFR**
▪ Separate plans for Supplier, Manufacturer and Retailer	▪ Shared plans developed jointly for Supplier and Manufacturer, Manufacturer and Retailer, and Supplier, Manufacturer and Retailer in a three-way implementation
▪ Order Generation based in history (Shipments, DC level sales, or POS data)	▪ Order Generation based in forecast, using POS data, promotion planning and other marketing activities
▪ Reactive	▪ Proactive
▪ Focused on execution	▪ Focused on planning
▪ Limited to Inventory and Logistics point of view	▪ Includes Inventory, Logistics, Sales, Marketing, Procurement and Planning point of view
▪ Goal is to cut company costs	▪ Goal is trading partners' revenue growth
▪ Related to inventory management	▪ More related to category management
▪ Works on efficient inventory replenishment only	▪ Works on promotion, product introduction, inventory levels & replenishment all the way to the shelf effectiveness
▪ Several forecasts for Supplier, Manufacturer & Retailer	▪ Single shared sales forecast based on collaborative process

2.3.1 CPFR Model

The CPFR model is a general framework for the collaborative aspects of planning forecasting and replenishment process to improve the supplier, manufacturer and retailer relationship through shared information. It also creates integrated supply chain method to improve efficiency through direct collaboration between all the chain /supplier, manufacturer and retailer/ with the ultimate focus on the customer. Basically CPFR model contains seller, buyer and end customer. Since Manufacturer /focal company/ is in the middle for all upstream and downstream chain it will act as both buyer and seller respective with suppliers and retailer, Suppliers are sellers and retailers are buyer all the time.

The general frame work of the CPFR model consist three major stages i.e. Planning, Forecasting and Replenishment and four major activates i.e. strategy & planning, demand and supply management, execution and finally analysis as shown below on the figure 2.2. The following Figure below illustrates the general CPFR framework, which can be applied to many industries.

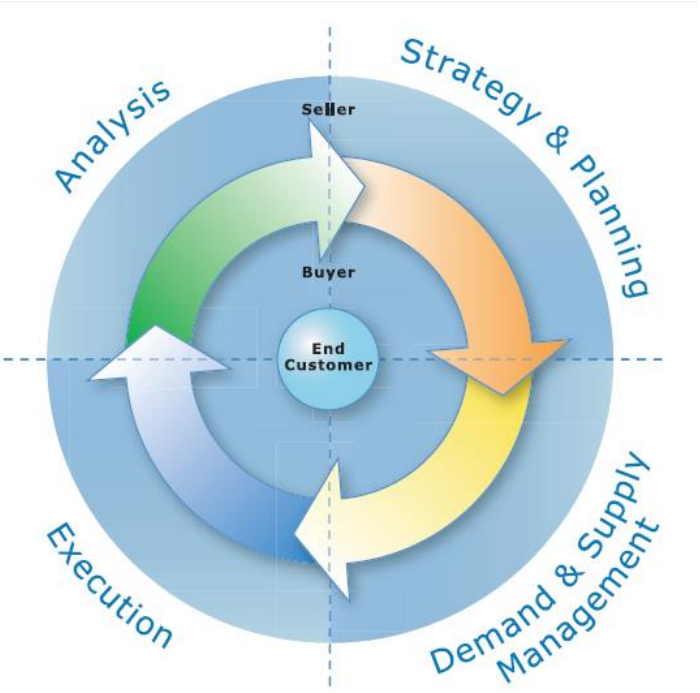


Figure 2.2 Model of CPFR

The major Collaborative activates in CPFR model are:

1. **Strategy & Planning:** establish the ground rules for the collaborative relationship. Determine product mix and placement, and develop event plans for the period.
2. **Demand & Supply Management:** Project consumer (point-of-sale) demand, as well as order and shipment requirements over the planning horizon.
3. **Execution:** Place orders, prepare and deliver shipments, receive and stock products on retail shelves, record sales transactions and make payments.
4. **Analysis:** Monitor planning and execution activities for exception conditions. Aggregate results, and calculate key performance metrics. Share insights and adjust plans for continuously improved results.

Under the above four major activity, there are eight collaborative task or step which both participant should follow. The following tables show the eight collaborative task of CPFR model, its purpose and outputs (ackerman, 2000; logility, 2000).

Table2.4 Collaborative Tasks in CPFR model

Steps	Collaborative Task	Purpose	Output
1	Develop a front-end agreement	• Two partners establish guide lines and rules for the collaborative relation ship • Develop general business agreements that includes the overall understanding & objective of collaboration and the resource to be employed throughout the CPFR process	• A published CPFR front – end agreement that gives both partners a co-authored blue print for beginning the relationship.
2	Create a joint business plan	• The two partners exchange information about their corporate Strategies and business plans in order to collaborate on developing a joint	• A mutually agreed-on joint business plan w/ch clearly identify the role, strategy and tactic for the item in

		business plan. • First they create a partnership strategy then define category roles, objectives and tactics • Finally establish item management profiles.	the agreement.
3	Create sales forecast	• Create sales forecast by using retailer sales data, causal information & information on planned events.	• sales forecast which is a base line for an order forecast
4	Create order planning /forecast	• Generate specific order forecast that support the shared sales forecast and the joint business plan.	• A time phased netted order forecast
5	Order generation	• Marks the transportation of the order forecast into a committed order. Order generation can be handled by either the manufacturer or distributer depending on competency, system and resource.	• A committed order generated directly from the frozen period of the order forecast. An order acknowledgement is sent as a result of the order
6	Order fulfillment	• Producing, shipping, delivering and stocking the product	• Fulfill the generated order
7	Exception management	• Identifies the item that fall outside during sales forecast and order forecast. • Manage exceptions	• List of exceptions in the sales and order forecast • Resolution of identified exceptions • Adjusted forecast
8	Performance assessment	• Measuring the performance of collaboration in terms of operational and financial measures	• The performance in terms of service level, forecast accuracy, lead time, inventory, costs…etc.

The first CPFR model was described and published in 1998 by VICS (Voluntary Inter Industry Commerce Standards Association) which is found in U.S.A and works as voluntarily with no profit. After that in 2004, VICS revised the model in order to adjust the Process of the Model to the changing global requirements by gaining more and more implementation experience on the original CPFR Model. The Comparison of CPFR Model Is tabulated below table 2.5

Table 2.5 Comparison of CPFR model

Models	Component	Description and Focus	Author	Implication
The First CPFR Model	▪ Contains four major activates ▪ Strategy & planning, ▪ Demand & Supply management, ▪ Execution and ▪ Analysis ▪ Contains **Nine** collaborative tasks /collaborative agreement, joint business plan, sales forecast, identify exceptions for sales forecast, resolution or collaboration on exception items, create order forecast, identify exception to the order forecast, resolve or collaborate on exception item and finally order generation	▪ CPFR is a supply chain management tool which incorporating planning, forecasting and replenishment under a single frame work that aims to enhance supply chain visibility by reducing any variance b/n supply and demand. ▪ Retailer and manufacturer have nine collaborative tasks	▪ VICS /Voluntary Inter industry Commerce Standard Association / , 1998	▪ Mainly focused on retailer and manufacturers collaboration activity. ▪ There is no performance assessments /evaluation/ method throughout the process.
The Revised CPFR Model	▪ Contains four major activates ▪ Strategy & Planning, ▪ Demand & Supply Management, ▪ Execution and ▪ Analysis	▪ CPFR is a business practice that combines the intelligence of multiple trading partners in the planning and fulfillment of	▪ VICS /Voluntary Inter industry Commerce Standard Association/, 2004	▪ Even if the model focused on retailer and manufacturers, it also included the supplier part. But the

	▪ Contains **eight** collaborative tasks /collaborative agreement, joint business plan, sales forecasting, order forecasting, order generation, order fulfillment, exception management and finally Performance assessments	customer demand. ▪ It links sales and marketing best practice to supply chain planning and execution process. ▪ Its objective is to increase availability to the customer while reducing inventory, transportation and logistics cost. ▪ Retailer and manufacturer have nine collaborative tasks		collaborative tasks of the manufacturer and suppliers are not included like the retailer & manufacturer. ▪ There is two major performance assessments /evaluation/ method i.e. operational measure and financial measure. ▪ Exception management criteria's are agreed in the collaboration arrangement and handled in sales & order forecast and order forecast step.

2.4 Supply Chain Performance Measurement

Unless we measure, we can't improve, so it is important to measure the performance of the complete supply chain and the individual processes. Performance measurement provides information for management and decision makers; enable identifying the success & potential of management strategies and facilitating the understanding of the situation. In addition to this it is helpful in the continuous improvement of SCM (Chan; 2003) and assists in directing management attention, revising company goals, and re-engineering business processes.

Neely et al., 2002 defined Performance Measurement System (PMS) as a balanced and dynamic system that enables support of decision-making processes by gathering, elaborating and analyzing information. Stefan Tangen (2004) proposed that performance be defined as the efficiency and effectiveness of action, which leads to the following definitions:

1. Performance measurement is defined as the process of quantifying the efficiency and effectiveness of action;
2. Performance Management System is defined as the set of metrics used to quantify the efficiency and effectiveness of an action.

Mainly the purpose of performance measurement system are; Identifying success, Identifying whether customer needs are meet, Better understanding of processes , Identifying bottlenecks, waste, problems and improvement opportunities, Providing factual decisions, Enabling progress, Tracking progress, Facilitating a more open and transparent communication and co-operation. Gunasekaran & Kobu (2007)

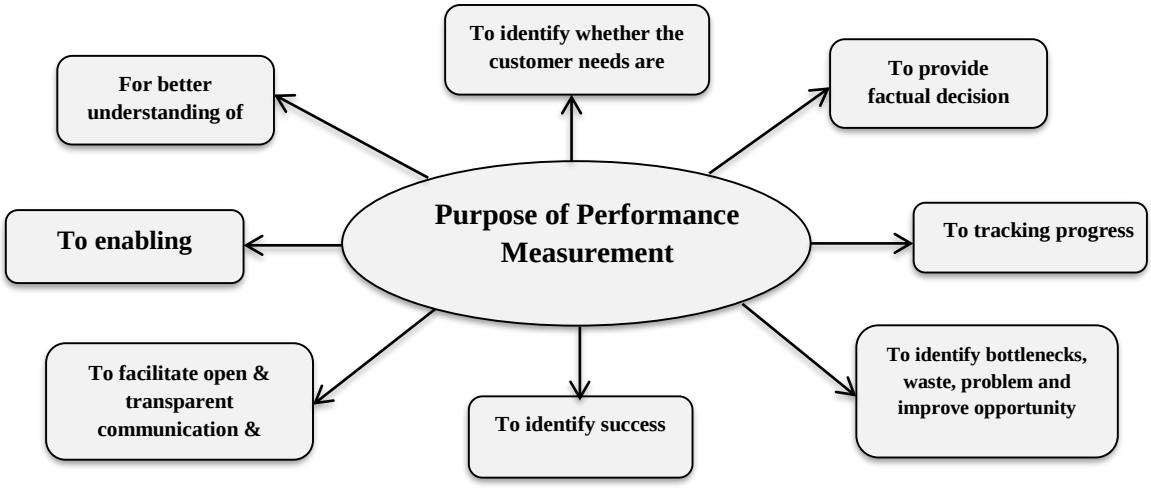


Figure 2.3 Purpose of Performance Measurement

Therefore the objective of supply chain performance measurement has to facilitate and enhance the efficiency and effectiveness of SC. The main goal of supply chain performance measurement models and frameworks is to support management by helping them to measure business performance, analyze and improve business operational efficiency through better decision-making processes (Tangen, 2005). An effective, integrated and balanced supply chain performance measurement system can engage the organization's performance measurement system as a vehicle for organizational change.

The following parameters can be used to evaluate the performance of the supply chain (Krajewski & Ritzman 2002): Lead Time, Cost, Capacity, Quality, Delivery, and Flexibility. Supply Chain performance can also be viewed in terms of qualitative & quantitative measures (Benita 1998; Viswanadham 2000).

- **Qualitative measures**: It needs the questionnaire or survey. Customer satisfaction, Flexibility, Information & Material Flow Integration, Effective Risk Management and Supplier Performance
- **Quantitative Measures:** They could be either nonfinancial or financial measures.

  Non-Financial Performance Measures: Cycle time or lead time, Customer service level, Inventory Levels and Resource Utilization.

  Financial Measures: There are two kinds of cost in a supply chain system such as fixed & variable costs. The objective of financial performance measure is to maximize the revenue & minimize the cost.

2.4.1 Supply Chain Performance and CPFR

Supply chain is the collection of all components and activities associated with the creation and delivery of a product or service. Logistics encompasses transportation, distribution, warehousing, material handling, and inventory management processes. Supply chain management addresses not only the supplying of a product to meet demand but also encompasses all the processes from product design, production, product promotion, and order fulfillment all the way through end-of-life recycling and disposal.

Supply chain collaboration helps firms reduce the costs of opportunism and monitoring that are inherent in market transactions through process integration and mutual trust, thus increasing the probability that partners behave in the best interest of the partnership (Croom, 2001). Supply chain collaboration also helps firms avoid internalizing an activity that may not be aligned with their competencies.

CPFR is a tool used to enhance the supply chain that should optimally yield in lower inventories, logistic costs and create efficiency in the whole supply chain to all participants. CPFR uses cooperative management in sharing key information about the supply chain between suppliers and retailers (sellers and buyers) who work together to satisfy the needs of the end customer.

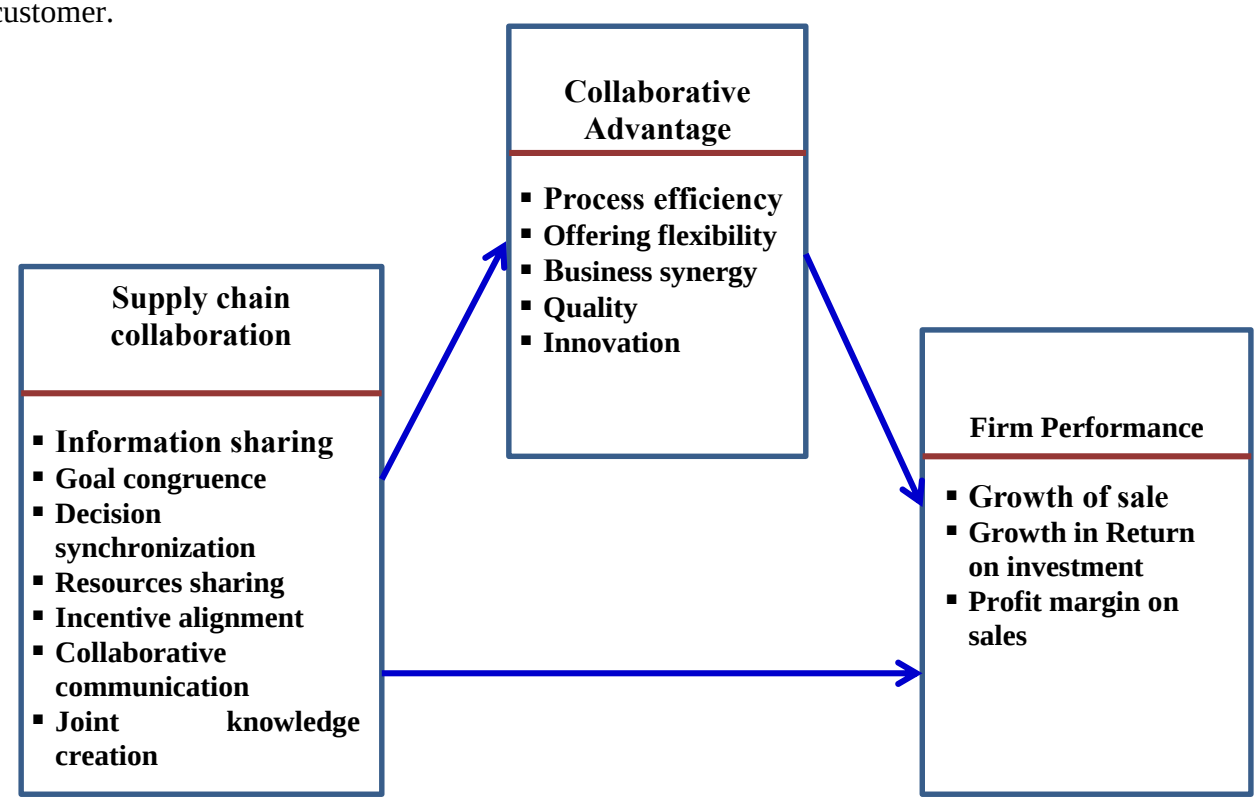


Figure 2.4 Impact of supply chain collaboration on collaborative advantage and firm performance (M.Cao, Q.Zhang)

CHAPTER 3

Background of Ethiopian Dairy Processing Industry

3.1 Ethiopian Dairy Processing Industry

The first attempt to introduce modern dairy production in the country was made by the Imperial regime in 1947, when 300 Friesian and Brown Swiss dairy cattle were received as a donation from the United Nations Relief and Rehabilitation Administration. A small milk processing plant was established in Addis Ababa to support commercial dairy production (Yigezu 2000). With the introduction of these cattle in the country, commercial liquid milk production started on large farms in Addis Ababa. During the second half of the 1960s, dairy production in the Addis Ababa area began to develop rapidly as a result of the expansion in large private dairy farms and the participation of smallholder producers.

In 1966, the government established the Addis Ababa Dairy Industry and later on in 1971, the Dairy Development Agency (DDA) to control and organize the collection, processing and distribution of locally produced milk. By 1972, the DDA was receiving about 21,000 liters of milk/day for processing. In addition to collecting milk, the DDA sold milk and dairy products through its kiosks and shops as well as to institutions. In 1979 it was merged with numerous other nationalized dairy farms to establish the Dairy Development Enterprise (DDE). The DDE includes large dairy farms, milk collection networks, and a processing plant. The DDE, which is privatized in 2007 and changed its name to Lame Dairy, has a capacity to process 60,000 liters/day of milk (Yigezu 2000).

With the downfall of the Derg regime in 1991, as a result of the country's policy reforms that aim to bring about a market-oriented economic system, the private sector has begun to enter the dairy sector and market as an important actor. Many private investors have established small and large dairy farms. This commercial farms use grade and crossbred animals that have the potential to produce 1120 – 2500 liters over 279 day lactation. This production system is now expanding in the highlands among mixed crop-livestock farmers, such as those found in Selale, Ada'a, Sendafa & Holetta, and serve as the major milk suppliers to the urban market.

Currently in the country there are twenty six (26) formal dairy processing industry and nine (9) new processing facilities in various stages of development. Most processors benefit from urban and peri-urban milk supply systems, and very few processors are invested in their own dairy farms to insure adequate milk supply and quality. However, these processors are operating only 50-60% of their production capacity due to scarcity of raw milk supplier.

Most of dairy processing industries in Ethiopia are located in Addis Ababa and around Addis Ababa which are in Sebeta, Sululta, Debrezeit and Debrebirhan. The following table shows the location of dairy processing industry in Ethiopia and the detail dairy industry profiles are attached in Annex 2.

Table 3.1 Location of Ethiopian dairy processing Industry

Location	**No of dairy Industry found**	**Name of Enterprises**
Addis Ababa	6	Lame Dairy, M.B PLC, Berta & His Family Dairy Processing, Ruth & Hirut Milk Processing, Chuye Milk & Milk Product Processer and Nuredin Hassen Milk processing Factory
Sebeta	1	Sebeta Agro Industry
Sululta	3	Selale Dairy Cooperative, Elmtu Integrated Milk Industry and Loni Agro Industry
Debrezeit	3	Holand Dairy, Genesis Farm and Ada'a Dairy Cooperatives
Sendafa	2	Etete Milk & Timret Agro Industry
Adama	1	Awash Melkasa Agro Industry
Hawassa	1	Almi fresh milk and milk product processing
Bahirdar	1	Tena Milk and Milk product PLC
Gonder	1	Jantekel Milk Cooperatives /Facil Milk/
Dire Dawa	1	Dire Dawa Milk Processing Industry
Mekele	1	Zemen Milk
-	5	Life Agro industry, Borowaqo Milk Processing Factory, Yakila Milk & Milk Product Processing Enterprise, Tsehay Reta milk processing industry, Emnet and Lijocha Milk & Milk product processing PLC.

3.2 Supply chain of Ethiopian dairy processing industry

The success of a milk processing industry depends on its ability to source a predictable, sufficient supply of milk, and its ability to assure a sizable market. Earlier studies (Lemma *et al*., 2008; Yilma *et al*., 2011), reported that weak linkages among the different actors in the dairy supply chain are some of the important factors that contribute to the poor development of Ethiopia's dairy sector. Different researchers stated in their study, different actors for Ethiopian dairy sector supply chain system. Therefore based on the previous studies the major actors in Ethiopian dairy supply chain system are: farm input suppliers, different scales of raw milk producers, cooperatives and unions, extension service providers, traders, processors, distributors, industry facilitators, development partners and consumers or end users.

Most of large scale processors are located near to urban areas to facilitate market access and available services. Institutional buyers are very important to many processors - universities, hospitals, schools or factories can provide a constant and assured customer base. But many large processors operate at less than 50% capacity, because of sourcing constraints. (AGP - LMD, 2013)

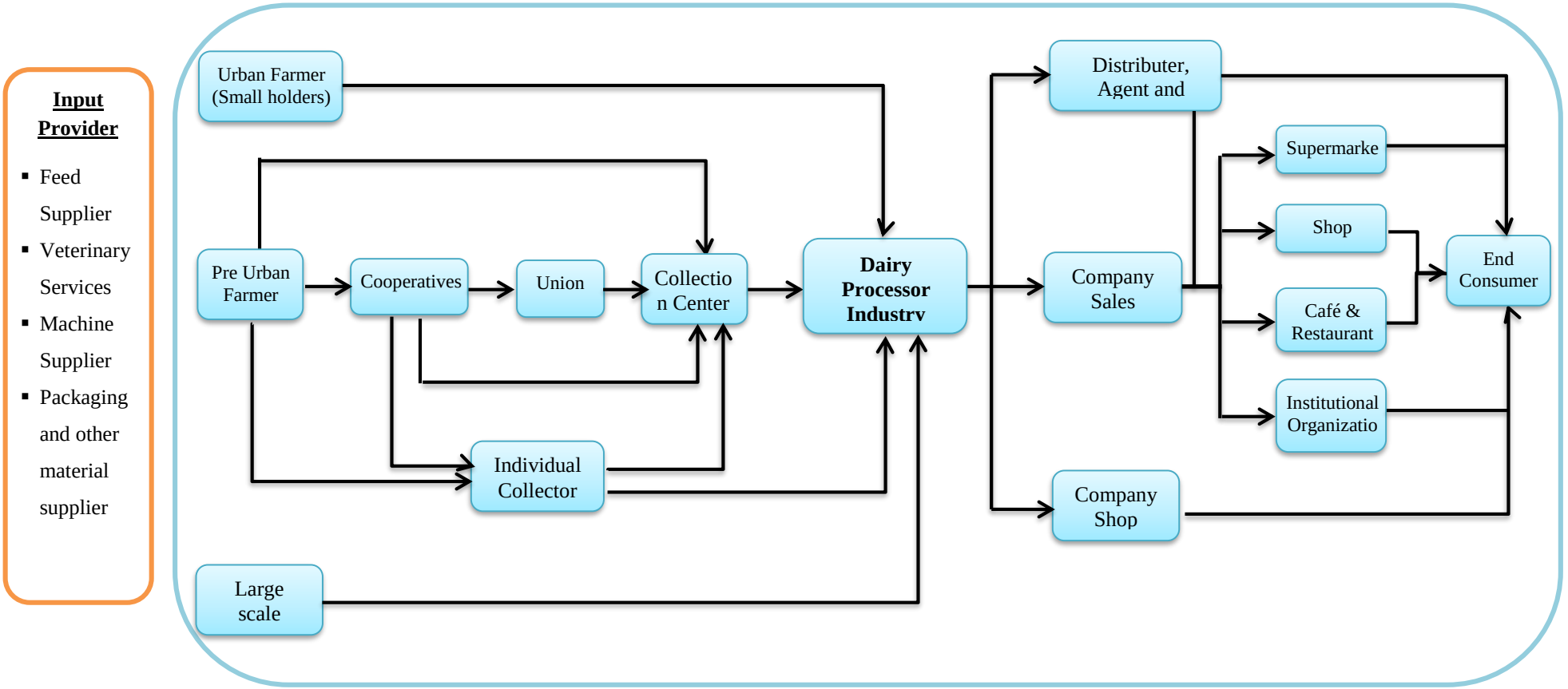
3.2.1 Upstream Actors in the Chain

The major raw milk suppliers in Ethiopian dairy processing supply chains are: small urban farmers, pre-unban farmers, large scale farmers, cooperatives and unions. In addition to this there are also direct and indirect upstream suppliers for dairy processing industry which provides farm inputs (feed and veterinary drugs), chemicals used during milk processing, equipment used for milk processing and storage and also packaging materials.

3.2.2 Downstream Actors in the Chain

The major downstream actors in the chain are: retailers / super markets and shops/, cafeterias & restaurants, different institutes /like universities, hospitals, schools, factories / and end consumers. The following below figure shows the supply chain of Ethiopian dairy processing industries.

Fig. 3.1 Supply Chain Network of Ethiopian Dairy Processing Industry



3.3 Over View of Ethiopian Dairy Sector

3.3.1 Ethiopian Milk Production System

Dairy production is practiced almost all over the country involving a vast number of small scale, medium scale and large scale farms. Based on climate, landholdings and integration with crop production, dairy production systems are classified as

- small scale rural,
- pre-urban and
- Urban

Small scale rural dairy production system is the dominant dairy production system practiced in the country. The smallholder farmers and pastoralists produce and supply 98% of the total milk production of the country (YONAD 2009). The system is not market-oriented and most of the milk produced is retained for home consumption. From the total annual milk production in rural areas, 85 % is used for household consumption, 7% is sold, 0.3% is used for wages in kind and the remaining 8% is used for other purposes such as production of edible and cosmetic butter and Ayib (Zelalem, 2011).

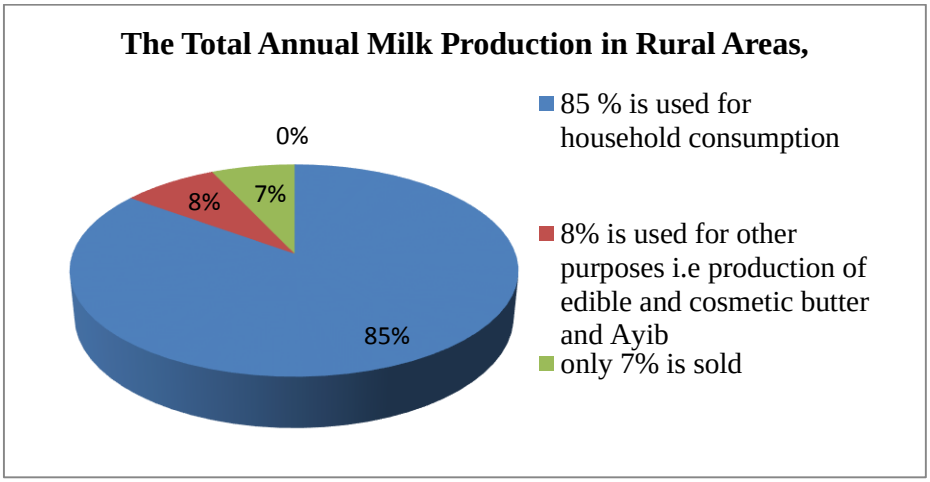


Figure 3.2Milk Production & Consumptions in Rural Area

Both Pre-Urban and Urban dairy production systems in general are located in cities and/or towns and focuses on production and sale of fluid milk, with little or no land resources, using the available human and capital resources mostly for specialized dairy production under stall feeding conditions. Of the total urban milk production, 73% is sold, 10% used for household

consumption, 9.4% goes for feeding calves and 7.6% is processed into butter and Ayib. From marketed milk 71% of the producers sell their milk directly to consumers. (Zelalem, 2011)

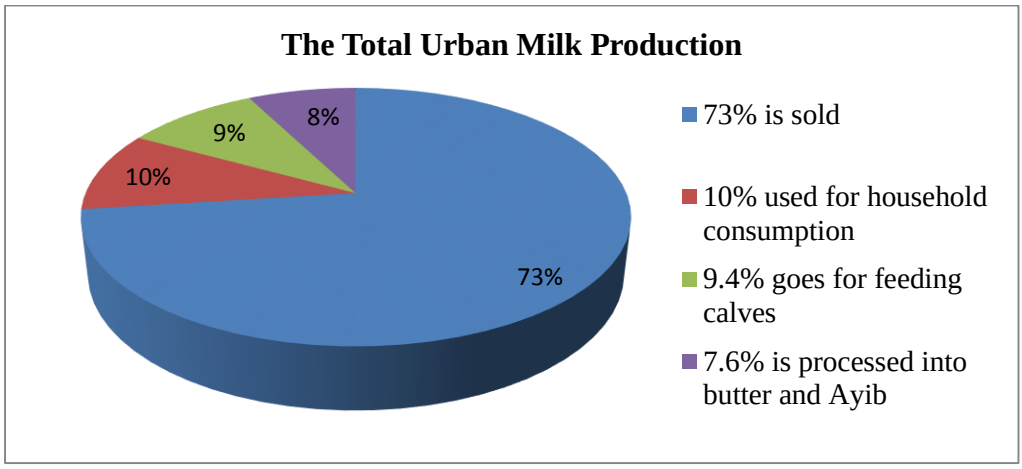


Figure 3.3 Milk Production & Consumptions in Urban Area

The average milk production per cow is 1.5 liters per day over a lactation period of 180 days, which is very low compared with the international benchmarks tabulated in table 3.2

Table 3.2: Productivity per Cow

Country	Yield (KG)
Republic Of South Korea	9,616
Israel	9,583
United State Of America	9,118
Sweden	8,152
Denmark	8,131
Algeria	1,320
Morocco	1,102
Egypt	997
Table Angola	482
Sudan	378
Ethiopia	270
Nigeria	240
Bangladesh	206
Tanzania	174

Source: (Livestock and Livestock characteristics, 2012)

Milk production in the country has generally increased over the last 10 years from about 1.5 billion liters in 2001 to about 2.2 billion liters in 2005 and around 2.9 billion liters in 2010. In 2011/12 Ethiopia produced 3.3 billion liters of milk, worth $1.2billion and imported an additional $10.6 million of dairy products. At 19 liters per annum, per capita, annual milk consumption is well below the world average of 105 liters and the African average of about 40 liters. (AGP - LMD, 2013). From the total milk produced in Ethiopia, 5% of milk produced is marketed as processed fluid milk.

3.3.2 Milk Demand in Ethiopian

The demand of milk and milk product is higher in urban areas where there is high population pressure. Higher incomes, larger urban populations and continued population growth will fuel higher demand for dairy products. The increasing trend of urbanization and population growth also leads to the appearance and expansion of specialized medium-to-large scale dairy enterprises that collect, pasteurize, pack and distribute milk to consumers in different parts of the country. However, consumption during the last four decades ranged from 16 to 19 liters per capita. (AGP-LMD2013)

Average global milk consumption per capita amounts to about 105 liters of milk /year and African average of 40 liters/year. However, in Ethiopian consumption during the last four decades ranged from 16 to 19 liters per capita.

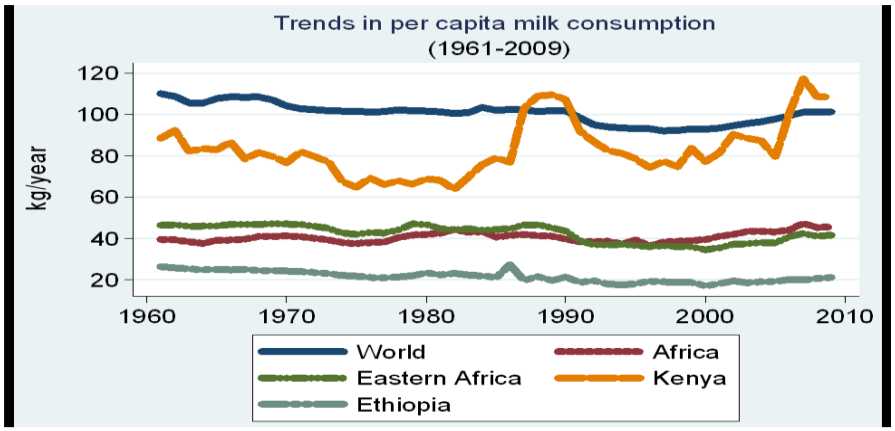


Figure 3.4:- International Dairy Consumption (AGP-LMD, March 31, 2013)

While many Ethiopians consume milk, they do not always use it as a staple food. They often regularly consume milk products, such as butter (kibe), yogurt and cottage cheese (ayib). Most milk, approximately 93%, is consumed and processed at home, while only 7% is supplied to

formal and informal markets (AGP-LMD2013). The following various factors are the reason for lower demand of dairy product in Ethiopia:-

- Price of milk is increasing rapidly /Pasteurized milk can cost more than 25 ETB (USD $1.25) per liter, which is unaffordable for most households/. Raw milk purchased in urban areas costs 10 -18 ETB/liter.
- Fluctuation in the demand of milk and other dairy products is in line with the various fasting periods observed by Orthodox Christians. There are 196 fasting days in a year.
- Milk is traditionally considered in many parts of Ethiopia to be a food item that is essential only for children and convalescent persons. Its nutritional benefits for normal adults tend to be overlooked.
- Producers and processors have trouble responding to uneven demand and lower prices during the fasting periods.

The main markets for processed milk are Ethiopia's main urban centers in Addis Ababa, Bahir Dar, DebreZeit, and Awassa. However, the majority of the milk consumed by most urban and semi-urban homes is still supplied through the informal sector: smallholder milk producers and traders directly supplying households, kiosks, hotels and coffee shops. Urban consumption is constrained by price, quality and availability.

Milk consumption tends to increase as income levels increase. The 2010 LOL study found that:

- The top 10% of earners in the Addis Ababa market consumed approximately 38% of the milk.
- The lowest income group – approximately 61% of the population – consumed only 23%.
- In non-urban areas, milk consumption varies by season and cow productivity. Consumed milk preference is for whole, raw milk, is either from milk production at home or by neighbors. The following Table shows rural smallholders' utilization of milk. Utilization depends on the ease of access to market.

Table 3.3 shows Rural Smallholders' utilization of milk (AGP-LMD2013)

. Product type	Household consumptions	Sale	Wages in kind	Traditional processing & other
Fresh milk	46.61	4.69	0.35	48.36
Butter	61.44	34.46	0.34	3.76
Cheese	83.34	12.96	0.15	3.55

A 2010 analysis by Land O'Lakes (LOL) projected that urban and pre-urban demand for milk and milk products will increase dramatically through 2020, and beyond. This demand was estimated to increase by 37% (low estimate) to 148% (high estimate, with nationwide consumption per capita of 27 liters). Zelalem Yi, Emmannuelle Gu. & Ameha Se. The projected demand of Ethiopian milk & milk product in their research as shown in the follow table below.

Table 3.4:- Projected demand for milk in Ethiopia

Year	Population in '000' based on current growth rate (2,27%)	Milk production, in million liters based on current growth rate, (4.1%)	Milk available for consumption (68% of the produce) in million liters	Demand for milk, in million liters based on FAO recommendation (62,5kg)	Gap between projected milk available for consumption and demand based on FAO's recommendation in million liters
2011	82 102	3 061	2 081	5 131	3 050
2012	84 335	3 186	2 166	5 271	3 105
2013	86 629	3 317	2 256	5 414	3 158
2014	88 985	3 453	2 348	5 562	3 214
2015	91 406	3 594	2 444	5 713	3 269
2016	93 892	3 742	2 545	5 868	3 323
2017	96 446	3 895	2 649	6 028	3 379
2018	99 069	4 055	2 757	6 192	3 435
2019	101 764	4 221	2 870	6 360	3 490
2020	104532	3394	2988	6533	3545

3.3.3 Ethiopian Milk Marketing System

Milk and milk products in Ethiopia are channeled to consumers through both formal and informal marketing systems.

i. Informal Milk Trade

About 95 % of the marketed milk at national level is channeled through the informal system. In this marketing system, milk and milk products may pass from producers to consumers directly or through one or more market agents. Producers sell the surplus milk produced to their neighbors and/or in the local markets, either as liquid milk or in the form of butter and/or Ayib (O'Connor, 1992).

This system is characterized by no license to operate, low cost of operation, high producer prices as compared with formal market and no regulation of operation (SNV, 2008). The hygienic condition of milk and milk products channeled through this system is also poor. This is mainly due to the prevailing situation where producers have limited knowledge of dairy product handling coupled with the inadequacy of dairy infrastructure such as cooling facilities and unavailability of clean water in the production areas.

ii. Formal Milk Trade

In the formal system, milk is collected at the cooperative or private milk collection centers and transported to processing plants. In this system, milk quality tests (principally acidity using alcohol and clot-on-boiling test, and density) are performed on delivery, thereby assuring the quality of milk. This has encouraged the producers to improve the hygiene conditions, storage and transportation of the milk in order to avoid rejection of the product on delivery to the collection center. The formal milk market appears to be expanding during the last decade with the private sector leading the dairy processing industry in Addis Ababa and other major regional towns. However, the share of milk sold in the formal market in Ethiopia that is 5% which is much less than that sold in neighboring countries: 15% in Kenya and 5% in Uganda (Muriuki and Thorpe, 2001). The major marketable milk products in Ethiopian through formal and informal marketing system are shown below in figure 3.5

Figure 3.5 Marketable milk products in Ethiopia

iii.Milk and Milk Products Exports and Imports

Ethiopia is not known to export dairy products. However, some insignificant quantities of milk and butter are exported to a few countries. Butter is mainly exported to Djibouti and South Africa (targeting the Ethiopians in Diaspora), while milk is solely exported to Somalia from the South Eastern Region of the country. As indicated by SNV (2006), small quantities of cream are exported to Djibouti from Dire Dawa. Ethiopia imported $10.6 million of dairy products in 2011/2 as shown in the figure below.

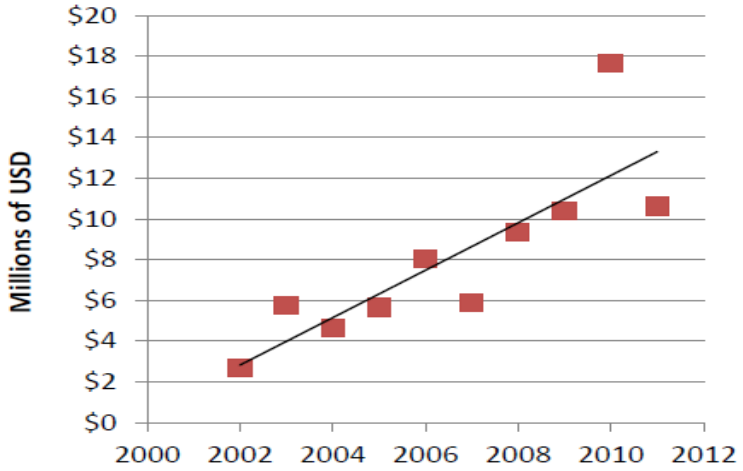


Figure 3.6 Ethiopian dairy product imports quantity

Source: -AGP-Livestock Market Development Project, March 31, 2013

3.3.4 Major challenges of Ethiopian Dairy sector

The development of the dairy sector in the country is hindered by a number of technical, institutional and socio-economic constraints. In different studies [TAM Consult (2008), YONAD (2009), Zelalem, Emmannuelle & Ameha (2011), AGP (2013), Eyassu& Reiner (2014), et al] researchers identified different challenges and problems which hinders the sectors not to be developed. The major challenges are;

1. **Low productivity of milk:** - Even though the country has large livestock amount, their productivity level is low and even not meeting the domestic demand of milk and milk product. To bridge the gap between supply and demand the country imports large volume of dairy products per annum. This low productivity is due to the following reasons;

- **Genetic limitation**: The main problem of milk production in the country is that of the poor genetic potential of the indigenous cattle, which gives rise to low milk output. Milk production is as low as 0.5 to 2 liters per day over a lactation period of 160 to 200 days.
- **Inadequate animal feed resources**: The primary constraints to increased milk production under all dairy production systems are inadequate feed resources, poor pasture development and the ever increasing feed prices. Farmers tend to keep cattle at stocking rates that far exceed the carrying capacity of their grazing lands. This has resulted in degraded pastures and eroded soils. Stock numbers are not normally reduced in the dry season leading to grazing lands becoming progressively overgrazed. In the dominating crop/livestock production system, producers supplement the feeding of their dairy cows with crop residues and farm by-products from their farms. In some cases, during the dry season, these feedstuffs can be the only feeds available to the animals.
- **Inadequate veterinary service provision**: The prevalence of various animal diseases, tick borne diseases, internal parasites and infectious diseases affect dairy development programs in varying scales, depending on ecological zones and management levels. The animal health services provided are inadequate; the cost of drugs and ascaricides is very high, while the diagnostic services are not readily available to the dairy farmer.
- **Limited access and high cost of dairy heifers/cows:** The improved crossbreed, grade and pure exotic dairy cattle are usually in short supply and when available, the high cost is a major problem. Prices of crossbreed cows and heifers are now unaffordable by the poor and the average smallholder farmers that would have liked to engage in the dairy business.

2. **Low quality of milk: -** One of the reasons for poor quality of milk is due to adulteration which is mostly done by farmers and brokers in processing and marketing of milk. The other quality problems are due to unhygienic processing methods and delays in collecting milk from the farmers to the processing industries and in delivering from the processors to the distributers. In addition to this lack of quality based pricing system during marketing and Lack of enforcement of quality control regulations and standards are also reasons for low milk quality.

3. **Inefficient and inadequate milk processes technologies**: - There is inefficient and inadequate milk processes technologies because of this most of the dairy processing industries are not produces different verities of processed milk & long shelf life products like UTH milk, powder milk, etc. They are also operating under their processing capacity around 40% - 50%.
4. **Seasonal demand:** - demand of milk and milk products are seasonal because of fasting time. Most of the dairy processing companies are process pasteurized milk with a short shelf life this means that processed volumes go down during the fasting time.
5. **Milk collection & transportation systems are not well organized:** - the major collection problems are delays in collecting the milk, lack of chilling and cooling center at potential milk producing and supply area, lack of substandard milk collecting utensils and buckets for up lifting the milk from supply centers. There is also Ineffectiveness and inadequate infrastructure and means of transportation.
6. **Illegal trade and inadequate market information: -** from the total produced milk only 5 to 7% of the milk is marketed as liquid milk and more than 90% of milk is marketed through informal channel and is unprocessed. In addition to this there are no promotional activities being carried out by various government offices to portray milk as a highly nutritious and essential food for the health of the nation, no price regulatory mechanisms in place that can make such an important food item easily available and affordable to a large segment of the population.
7. **Weak linkages between research, extension service providers and technology users**: Weak linkages between research, extension, and technology users are one of the critical factors that have hindered dairy development in the country. This weakness stems partially from the absence of sound linkage policies in the agricultural knowledge generation and transfer systems. A shift towards a developed dairy industry requires more support from advisory services and more effective links with research services.

In general weak linkages among the different actors in the dairy value chain and the above listed constraints are the main factors that contribute to the poor development of Ethiopia's dairy sector.

CHAPTER 4

Data Collection, Presentation and Analysis

4.1 Data Collection

Data were collected by using primary and secondary data collection system.

i. **Primary Data Collection:** Primary data were collected by using interview and questioners.

a. Interviews

Interview was aimed at getting the overall insight on the sector and the dairy processing industries from the major stakeholders. For this purpose a total of 10 peoples were interviewed composed of 3 from Ethiopian dairy and meat development institute, 2 from Ethiopian industry minister, 1 from agriculture minister, 1 from dairy cooperative union and 3 from dairy processing industries regarding on

- Actors in the value chain of Ethiopian dairy sector
- Governmental support & regulation method of the sector,
- The current statues of Ethiopian dairy industries,
- Supply chain system of the dairy industry
- Major challenges and opportunities of the dairy industries.

b. Survey Questionnaire

Questionnaire is developed in order to capture information regarding on the current status of Ethiopian dairy processing industry, their supply chain management practice and performance, their supply chain collaborative practices, their Planning & Forecasting method throughout the chain and major challenges in the chain.

This questionnaire were distributed in to fifteen dairy processing industries which is currently functional and found in different level, i.e. large, medium and small dairy industries and twelve dairy processing industry returned the questionnaire. The questionnaire parts divide in two major sections and contain a total of forty one questions.

Section I. Contain 4 questions about respondent profile and 5 questions about company profile total of nine questions.

Section II. Contains thirty two questions which are focused on:

- The company's existing supply chain management system,

- Their awareness on managing supply chain,
- How much did they actually benefit from managing their supply chain
- Their planning and forecasting practice and their customer handling mechanisms,
- Their supply chain collaborative practices and challenges in their supply chain system.

The Questionnaire is attached in Annex 1.

ii. **Secondary data collection:** Secondary data's are collected from governmental and non-governmental organization reports, from Researches and journals which are published in supply chain management, CPFR and dairy sector.

4.2 Sampling Method

There are different sampling methods. From those methods the researcher used stratified sampling method, because stratified sampling method is used when representative from each subgroup within the population need to be represented in the sample. So in the dairy industry all industries are not on the same or equal status, some dairy industries are categorized under large industry, some are categorized under medium level industry and the rest industries are categorized under small industry. Therefore in order to make the research comprehensive and include all level of dairy industry, stratify sampling method is preferable for this study.

From The sampled twelve dairy industries, five industries (41.6%) are under large industry category, five industries (41.6%) are under medium industry status category and the remaining two industries (16.7%) are under small industry status category. The following table below shows the selected sample industry and their status.

Table 4.1 List of dairy industry which respond the questioner

S/no.	Company Name	Brand Name	Location	Status
1	Sebeta Agro Industry	Mama milk	Sebeta	Large
2	Lame Dairy PLC	Shola milk	Addis Ababa	Large
3	M.BC PLC	Family Milk	Addis Ababa	Large
4	Elemtu Integrated Milk Industry	Harme milk	Sululta	Large
5	Selale Milk Industry	Selale milk	Sululta	Large
6	Loni agro industry	Loni Milk	Sululta	Middle
7	Ada'a Cooperatives	Ada'a milk	Debrezeit	Middle
8	Holand Dairy PLC	Holand milk	Debrezeit	Middle
9	Genesis Farm	Genesis milk	Debrezeit	Middle
10	Worksew Legesse Agro Industry	Etete milk	Sendafa Beke	Middle
11	Timiret Agro Industry	Timiret milk	Sendafa	Small
12	Tena Milk Processing Factory	Tena Milk	Baihr Dar	Small

4.3 Data Presentation and Analysis

The collected data present in the form of different charts and tables with brief explanations and then analyzed using percentage value.

4.3.1 Qualitative Data Presentation and Analysis

This section contains the summarized data from interviews of governmental organization in the sector /i.e. Ethiopian dairy & meat development institute, Ethiopian industry minister & Ethiopian Agriculture minister/.

According to the interviewees' response, the major challenges in supply chain management of Ethiopian dairy industries are: shortage of raw milk supply, seasonal demand and supply because of long fasting time in orthodox religion, poor quality of milk due to adulteration and unhygienic processing methods, poor transportation and infrastructure facility, unfair

competition between processors (in raw milk purchasing), lack of harmonized tariff on intraregional trade in dairy product, lack of quality based pricing system during raw milk marketing, lack of regulatory body and poor governmental support for the sector.

4.3.2 Quantitative Data Presentation and Analysis

The qualitative data presented in tables and charts, analyzed by using percentage value. It also contains five parts: Respondent profile, The current status/ profile/ of sample dairy industry, their supply chain managing practices, their supply chain collaborative practices, their supply chain performance level and major challenges in their supply chain system.

1. **Respondent Profile:** The respondent profile is attached in annex 2.

2. **Current Status of Dairy Industry**

2.1 Almost all sampled dairy industries produce similar and limited type of products and this is because of inefficient and inadequate milk processes technologies in the sector. Due to this the country incurs a lot of dollars to import different variety of dairy product from other countries in order to fulfill the demand gap. The following table shows the product type which the sample industry currently produced.

Table 4.1 sample dairy industry product type

Type of product	From total sample industry	Percentage
Pasteurized Milk	12	100 %
Yogurt	12	100 %
Cheese	12	100 %
Butter	12	100 %
UHT milk	1	8 %
Powder Milk	-	0%

2.2 From the 12 sample dairy processing industry, almost all of them are operating under their production capacity which is 30% - 50% of their designed capacity. This is due to shortage of raw milk supply and the reason for supply shortage is because of low productivity level of milk and only 5 to 7% of produced raw milk supply to the market. The following table 5.2 and figure 5.1 shows the production capacity and current operation capacity of the sample dairy industry.

Table 4.2 Sample Dairy Industry Production Capacity

S/No	Sample Industries	Production Capacity (Lt/day)	Currently produce (Lt/day)	Percentage %
1	Lame Dairy PLC	60,000	35,000	58%
2	Sebeta Agro Industry	44,000	30,000	68%
3	Worksew Legesse Agro Industry	35,000	7,000	20%
4	Selale Milk Industry	32,000	7,000	22%
5	Elemtu Integrated Milk Industry	30,000	13,000	43%
6	M.BC PLC	20,000	10,000	50%
7	Ada'a Cooperatives	15,000	4,000	27%
8	Holand Dairy PLC	15,000	5,000	33%
9	Loni agro industry P.L.C	10,000	4,500	45%
10	Tena Milk Processing Factory	10,000	3,500	35%
11	Genesis Farm	7000	3,000	43%
12	Timiret Agro Industry	1,000	500	50%

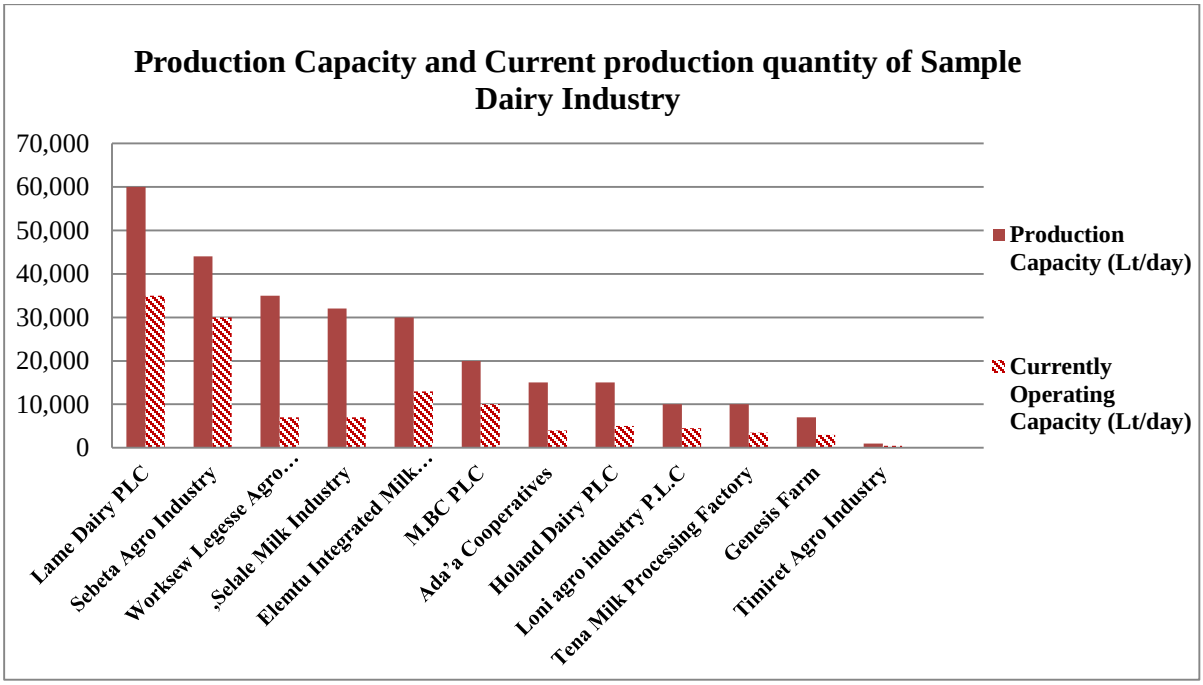


Fig. 4.1 sample industry production capacity and currently production quantity

2.3 All of the sample dairy industries market strategy is 100 % locally. None of them export their product to international market because of: low quality level compere to international standards, limited product type (almost all industries produce short shelf life products) and using low technology level throughout the chain is hindering the sectors competitiveness in international market.

2.4 From the total sampled dairy industry, ten industries /83%/ are get raw milk through purchasing from different milk producers, i.e. from individual farmers, individual collectors, cooperatives and unions. Since most of the dairy processing industries are getting raw milk from other supply, there should be well integrated and collaborated supply chain management. But currently due to poor collaboration on the chain, the demand and supply is not balanced. The following table 5.3 and figure 5.2 shows raw material access of sample dairy processing industry.

Table 4.3 access of raw milk

Access to raw milk	From the sampled 12 industry	Percentage
Only From Own farm	0	0%
Through purchasing	10	83%
Both	2	17%

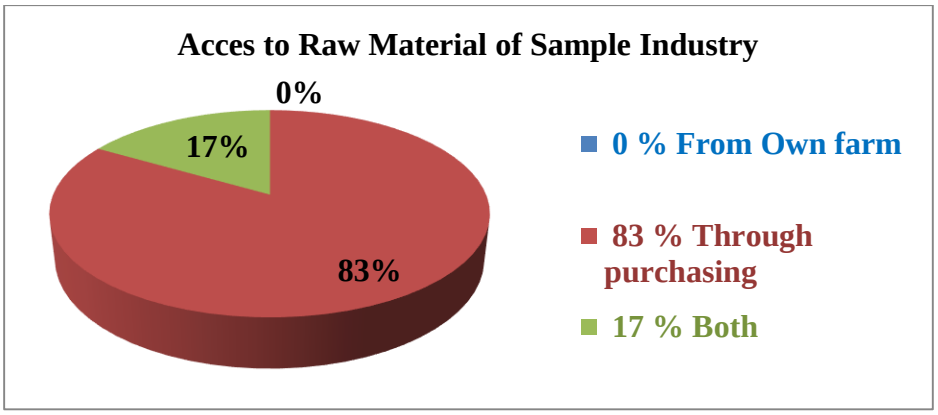


Fig. 4.2 raw material access of sample dairy processing industry

2.5 From 12 sample industry 11 industries have their own milk collecting center which is found outside their processing plant.

2.6 The sample industry distributes their product through wholesalers, distributers & retailer and in their distribution shop.

3. Supply Chain Management Practices

Supply chain management practice is defined as a set of activates under taken in an organization to promote effective management of its supply chain. It includes the following activates, information sharing, cost reduction, increasing revenue, resource planning & utilization, customer satisfaction, flexibility.

3.1 From the sample dairy processing industry: 22.2% greatly, 44.4% average and 33.3% little get better quality and quantity of information from managing their supply chain.

3.2 From the sampled industry 11.1% a lot, 22.2% greatly, 44.4% average and 22.2 % little reduce their cost through managing supply chain.

3.3 From the sampled industry 11.1% greatly, 44.4% average and 44.4% little actually increase their revenue through managing their supply chain.

3.4 33.3% average and 66.7 % little get benefit in resource planning and utilization through management of supply chain.

3.5 11.1% a lot, 22.2% greatly, 33.3% average and 33.3% littlie actually benefit in maximize their customer satisfaction through managing their supply chain.

3.6 22.2% average and 77.8% little increase their flexibility through managing their supply chain.

The summarized actual benefit of sample dairy industry through managing their supply chain is only 8.2% a lot, 18% greatly and 34.4% average & 39.3% little getting benefit in better quality and quantity of information, Cost reduction, Better resource planning and utilization , Better operational efficiency and Maximize customer satisfaction and flexibility.

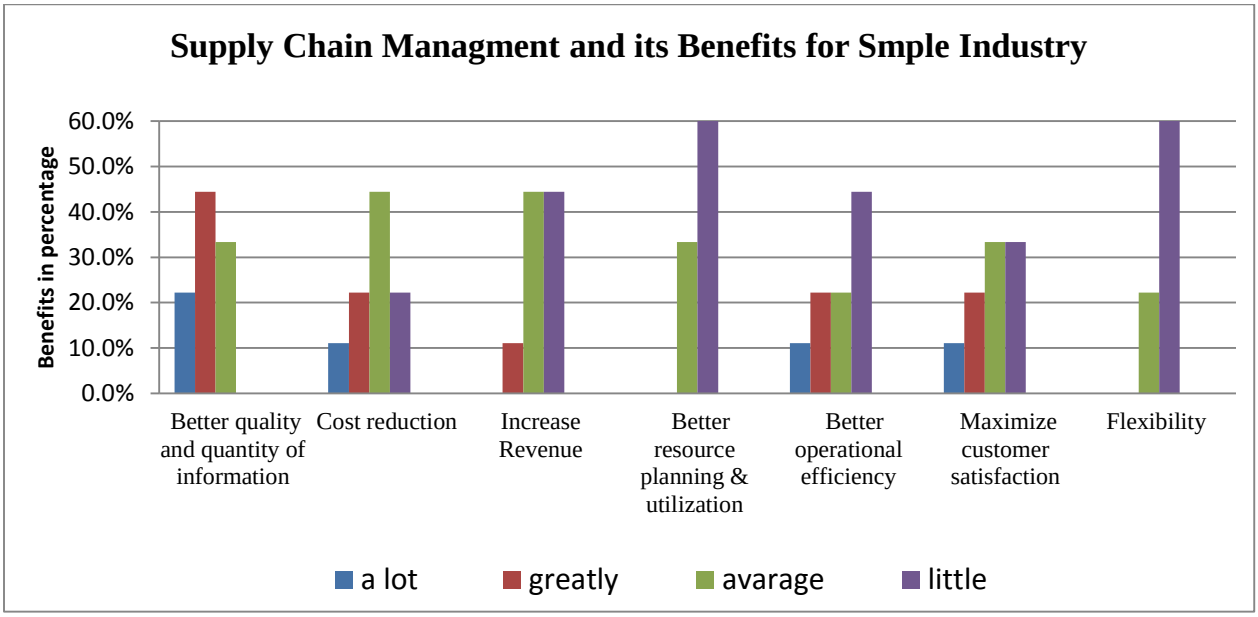


Fig 4.3 sample industry benefits through managing their supply chain

4. Their Supply Chain Collaboration Practices

From the total sampled dairy industries only 6% have good, 31% have fair and 63% have poor practice of supply chain collaboration in terms of,

- Information sharing with suppliers, processors and with different supply chain actors,
- Decision synchronization and solving problems collaboratively,
- Resource sharing and
- Collaborative promoting factor i.e. in supply evaluation & audit, in rewarding high performing suppliers, in good customer handling mechanism and reward high performing wholesalers & retailers. The following figure 5.4 shows the collaborative practice of sample industry.

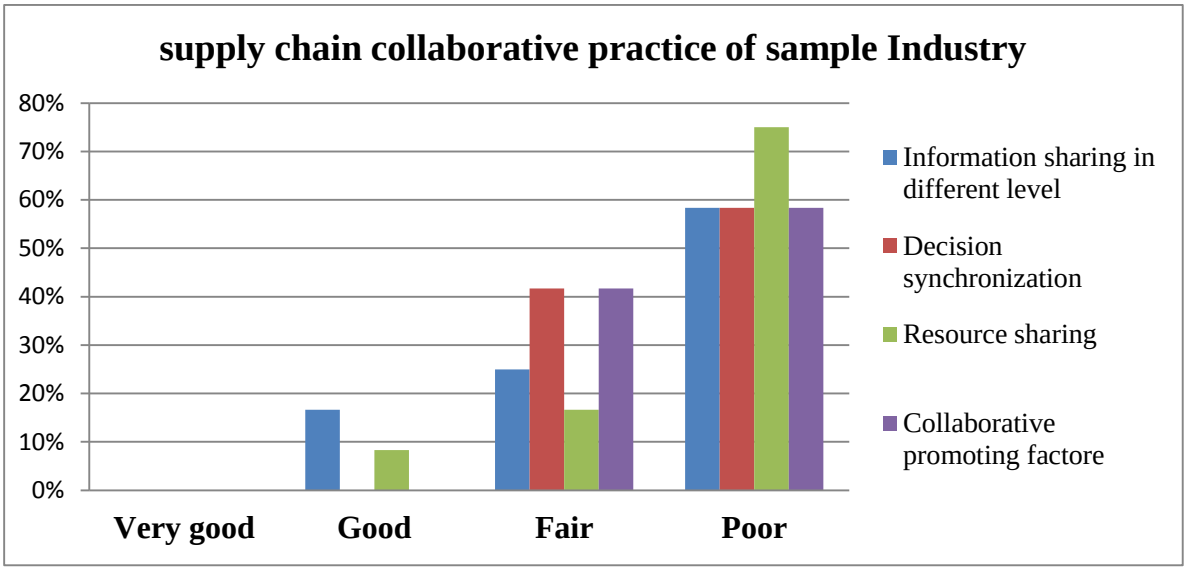


Figure 4.4 supply chain collaborative practice of sample industry

5. Supply chain performance of Sample dairy processing industry

The sampled dairy processing industry Supply chain performance 10% of them have good, 35% of them have fair and 54% of them have poor performance in terms of On time production & delivery, Responsiveness to fast procurement, Flexible to customer need, Material quality & cost, Profit growth

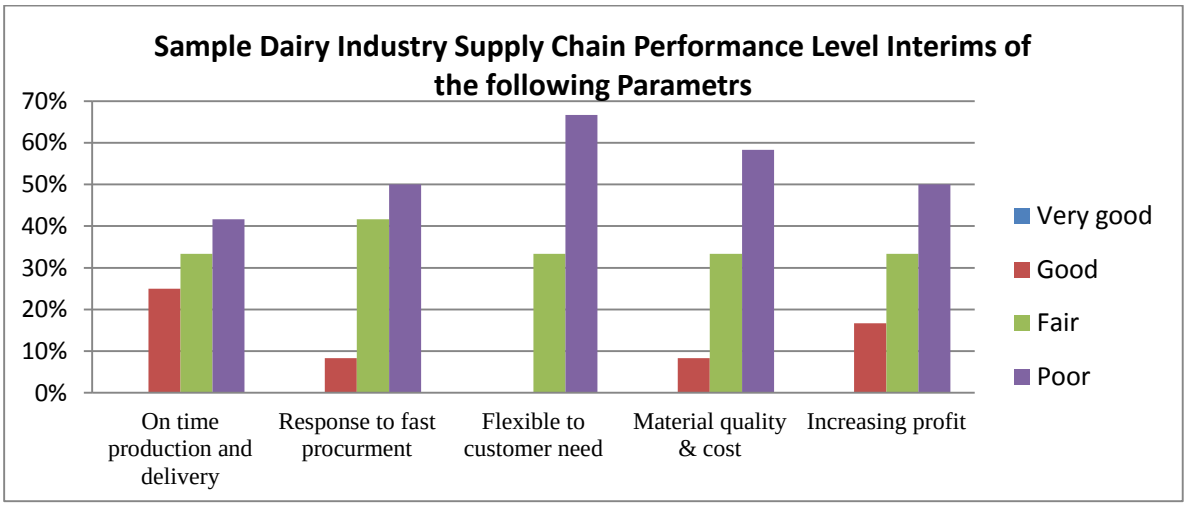


Figure 4.5 sample industry supply chain performances.

4.4 Conclusion and Implication

I) **Interview:** From the interview result what can understand that the Ethiopian dairy industry supply chain is hindered by a lot of challenges and the supply chain is characterized by poor collaboration and integration system.

II) **Questionnaire:** From the questionnaire result,

- Their supply chain managing practices of the sample dairy industries are poor and due to this they are not beneficiary from their supply chain management system in the expected level i.e. in getting qualitative & quantitative information, in minimizing their cost, in better resource planning & utilization, in increasing their operational efficiency, in increasing their flexibility and in satisfying their customers need.
- Their supply chain collaborative practices of the sample dairy industry are poor in terms of information sharing, decision synchronization and collaborative promoting factories.
- The supply chain performance of the sample dairy industries are poor in terms of on time production & delivery, flexible to customer need, material quality & cost and in terms of maximizing profit.

In General, from the above analysis what the author conclude that the collaboration and integration of Ethiopian dairy industry supply chain system is very week, due to this the performance is poor and it needs improvement.

CHAPTER 5

CPFR Model Development for Ethiopian Dairy Industry Supply Chain

This chapter provides the detail description of the model and how the Ethiopian dairy processing industry can create collaboration with the upstream and downstream chain through CPFR.

5.1 Description of the Model

The main purpose of using CPFR model is to improve the efficiency and relationship of supplier, manufacturer and retailer through collaborated planning process and shared information with the ultimate focus on customer. As briefly explained on the problem statement and on the data analysis part, Ethiopian dairy processing industry supply chain is characterized by poor collaboration and weak information sharing practice throughout the chain. Hence in order to create a better collaboration, information sharing system and improve the supply chain performance, using CPFR is one of the best solutions for the sector. So based on the above reasons, this study tries to adapt the CPFR model for the Ethiopian dairy processing industry supply chain system.

In this study, N - tier CPFR model /CPFR model for more than two participant/ is used in order to create collaboration for the upstream and downstream of the chain with manufacturer. Therefore, supplier, dairy processing industry, retailer/agent/ and customers are major actors which included on the model.

The general frame work of the adapted model has three main parts /Planning, forecasting & Replenishments/ and divided in to four phases /Strategy & planning, Demand & supply management, Execution and Analysis/ as shown below in the figure.

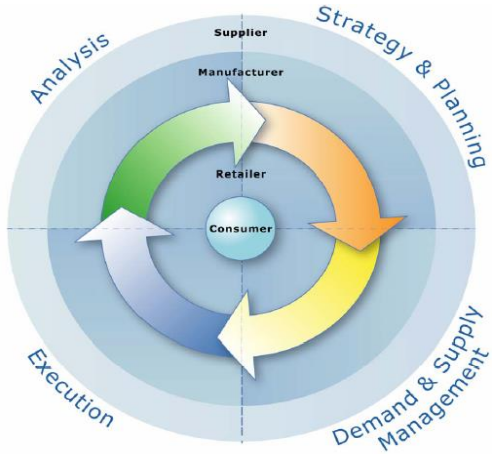


Fig 5.1 CPFR Model for more than two participants /N-tires Collaboration /VICS, 2004/

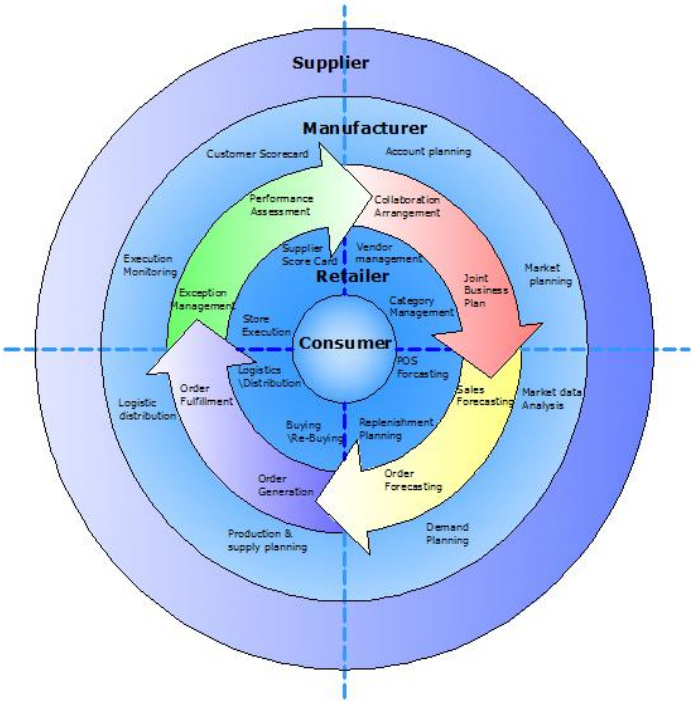


Fig. 5.2 CPFR Model /collaboration of Manufacturer with retailer/

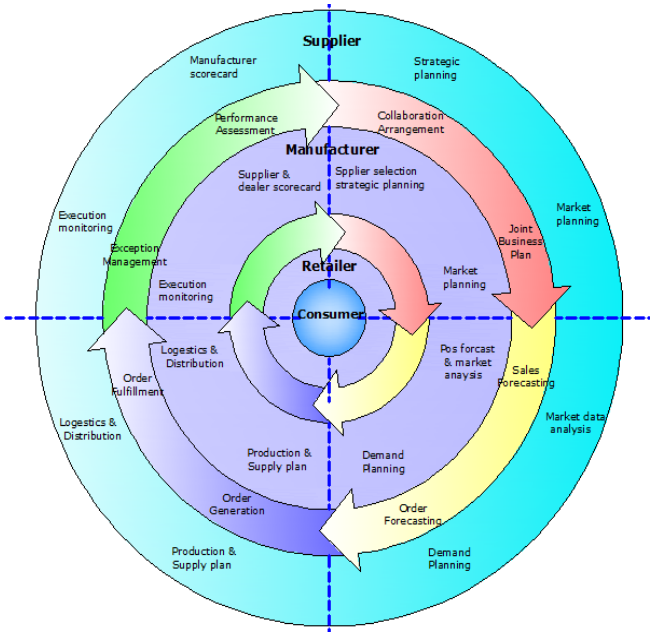


Fig. 5.3 CPFR Model /collaboration of Manufacture with supplier/

5.2 Components of the Model

The collaboration activities and tasks in the model are included for both upper stream and downstream of the chain with manufacturer. Therefore the model is divided in to two main parts:

1. Collaboration of dairy processing industry with downstream chain /retailer / and
2. Collaboration of dairy processing industry with upstream chain /suppliers/

Since most of the Ethiopian dairy processing industry products are short shelf life and perishables, the production system should be make to order rather than make to stock. Therefore, for make to order production system, it is better to start the collaboration from retailer side which is very close to end customer.

The following table 5.1 indicates the detail collaboration task and separate tasks of retailer dairy processing industry and supplier in the model.

Table 5.1 Phase of CPFR model and collaboration Tasks of Retailer Manufacturer and Suppliers matrix

a. Retailer Task	b. Collaboration Task	c. Dairy Processing Industry		d. Collaboration Task	e. Supplier Task
Phase I. Strategy and Planning					
Vendor Management	Collaborative Arrangement	Account planning	Supplier selection	Collaborative Arrangement	Strategic planning
Category Management	Joint business plan	Market planning	Strategic planning & Market planning	Joint Business Plan	Market planning
Phase II. Demand and Supply Management					
POS Forecasting	Sales Forecasting	Market data analysis	POS forecast & Market analysis	Sales forecasting	Market data analysis
Replenishment Planning	Order Planning / Forecasting	Demand planning	Demand planning	Order planning / forecasting/	Demand planning
Phase III. Execution					
Buying /Re-Buying	Order Generation	Production & supply planning	Production & supply planning	Order generation	Production and supply planning
Logistics / Distribution	Order Fulfillment	Logistic distribution	Logistic & Distribution	Order fulfillment	Logistic & distribution
Phase IV. Analysis /Performance Measurement/					
Store Execution	Exception management	Execution monitoring	Execution monitoring	Exception management	Execution monitoring
Supplier Score Card	Performance assessment	Customer scorecard	Supply & dealer scorecard	Performance assessment	Manufacturing scorecard

5.2.1 Collaboration of Dairy Processing Industry with Retailer

In this collaboration type, the dairy processing industry and the downstream supply chain actor /retailers/ collaborates with the ultimate focus of end customers. Since the dairy processing industry produce and deliver the product to the retailer, the dairy processing industry is sellers and the retailer/agent/ is buyer. The following figure 5.4 shows the collaboration frame work of dairy processing industry with retailer in CPFR model.

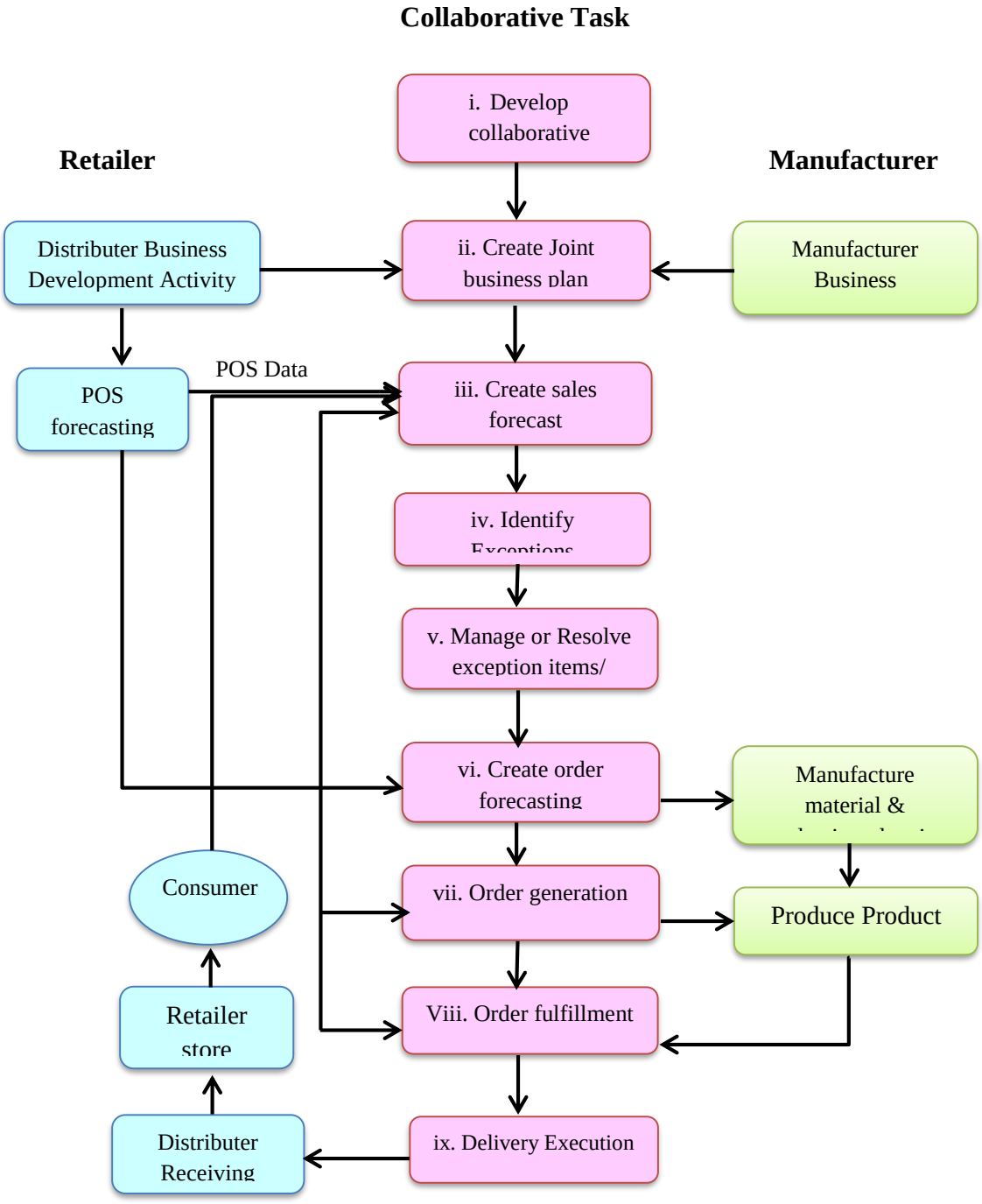


Fig.5.4 Collaboration Frame work of Dairy Processing Industry with Retailer

Phase I. Strategy and planning

Strategy and planning is the first collaborative phase of collaborative planning, forecasting & replenishment model, and in this stage rules and basic principles are defined for the collaboration of the dairy processing industry with retailers. The descriptions in the middle bar represent joint activities executed by the dairy processing industry together with the retailers. The left column contains activities which are carried out only by the retailer and the right column represents activates of the dairy processing industry. Each task is explained in detail below figure 5.5.

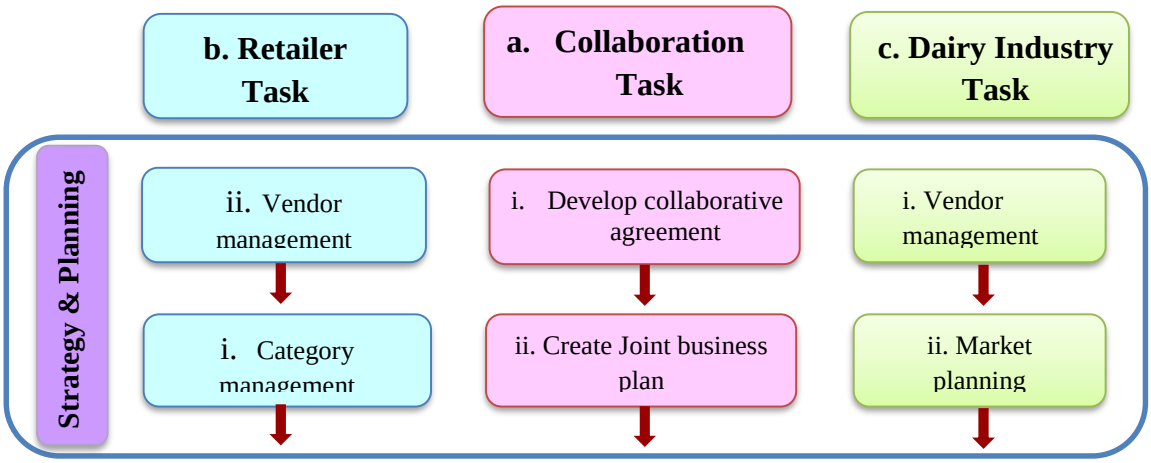


Figure 5.5 CPFR Model Strategies and Planning Phase

a. Collaboration Task on Strategy & Planning phase

In this collaborative task, the dairy processing industry develops the ground rules for the collaborative relationships; determine product mix and placement by developing collaborative arrangement ant joint business plan.

i. Collaborative Agreement

In this activity the retailer and the dairy processing company briefly describes the following point of agreements

- **Outcomes, Goals & Objective**: which describes what the dairy processing industry & retailers want to achieve,
- **Collaborative Value**: describe value or principles that guide the relationships and work of the collaboration.
- **Roles & Responsibilities**: describes who will do what, who will be responsible for what, who will report to whom, how the collaboration and its activity will be managed

- **Resource Committee**: describe staff, facility and in kind commitment
- **Finance Committee**: describe the financial contribution of each partner and any other financial arrangements,
- **Evaluation**: specify how the collaboration will evaluate and identified outcomes,
- **Decision Making**: identify a mutual satisfactory process for making significant decision,
- **Resolve Conflict**: agree a mutual satisfactory process to resolve conflict and complaints,
- **Termination of Collaboration or Partner Involvement**: specify a mutual satisfactory process to terminate the collaboration or a partner's involvement in the collaboration.

ii. **Joint Business Plan**

In this activity both the retailers and dairy processing industries work out a business plan taking into account their individual corporate strategies. The development of a common business plan improves the quality of projections in that available information from both parties.

In the joint business plan the retailer and the dairy processing industries clearly identifies the roles, strategies and tactics for the product /item/ that are to be brought under the umbrella of CPFR. In the business plan the following points should be discussed and set:

- **Vision**: The vision of the business in terms of its physical appearance, size and activity.
- **Mission**: The mission which indicates the purpose of the business should clearly set.
- **Objectives**: The objective which is the broad result of what the business needs/wants to achieve in the medium /long term should be set.
- **Strategies**: The participant should set the rules and guide lines by which mission and objective will be achieved.
- **Goals**: The participant should specified time based measurements to be achieved
- The participant should clearly define Joint calendar for promotion, inventory policy, store opening/closing, product change for each product category and type of product included on the agreement.
- **Market Analysis:** The assessment of the target population, competition and needs for marketing the product, should be analyze in order to determine if there is a market for the product, to establish the need for developing a marketing plan and to ascertain market information that will assist in the sale of the product or service.

b. Retailer Task on Strategy & Planning phase

In the strategy and planning phase, the retailer separately should work on vender management and category management.

i. Vendor Management

Vendor management processes is the end-to-end lifecycle of the vendor relationship from procurement to performance management. It includes demand management, contract management, change management, transition management, risk management, knowledge management, and vendor performance management. It also enables organizations to control costs, drive services excellence and mitigate risk to gain increased value from their vendors.

ii. Category Management

The retailers do category management in order to optimize assortments, promotions and product introductions, as well as consumer value creation. It also involves the simultaneous management of price, shelf space merchandizing strategy, promotional efforts and other. The assortment forming includes the tactical part of the process and the number of SKUs in the category based on consumer needs. The major steps for category management are:

1. First defining the category and its role,
2. Establishing the measures for the performance of the category,
3. Determining the strategies, tactics and then implementing.

c. Dairy Processing Industry Task on Strategy & Planning phase

In the strategy and planning phase, the dairy processing industry separately should work on account planning and market planning.

i. Account Planning

Account planning is a process of bringing the customer in to developing advertising and proactively influence the future. Therefore the dairy processing industry should prepare the account plan through considering the past performance, alanine with current realities and develop or expand in to opportunities for future growth.

ii. Market Planning

Market planning describes business activities involved in accomplishing specific marketing objectives within a set time frame. The process typically results in marketing strategy that can be used to enhance sales for the business producing it. Therefore dairy processing industry should prepare the market plan in order to get a clear path of what their strengths are compared to their competitors, who are their best customers, how can they find more of them, what is

working to get their more customers, and keep their existing ones happy & loyal. Basically there are 5 simple steps build a marketing plan for a business (An Oracle White Paper, 2006).

Step1. What Are You Good At: Survey your customers to find out what they like and don't like about your company, products or services.

Step2. Know Your Target Customer: List out your customers and sort their attributes the type of products they purchased and total amount of each purchase/

Step3.Know your 4Ps (product, price, promotion & place): How you'll name your product/company to how you'll package it, what is the product you are offering, How much you'll charge, the payment or discount terms, and when, what channels and where you'll sell your products, your advertising & communication strategy.

Step4. Get the Word Out: Make a list of each group of your target customers. Next to each write down the benefits that will make them purchase, get your messaging right for each target audience you serve.

Step5. Analyze Continually: need to continually analyze what's working and what you'll need to refine.

Phase II. Demand and Supply Management

Demand and Supply management is the second collaboration phase of the CPFR model and is about forecasting and synchronizing. The main process is predicting customer demand and determining how that demand can be synchronized with the capabilities of the supply chain. Each task is explained in detail below figure 5.6.

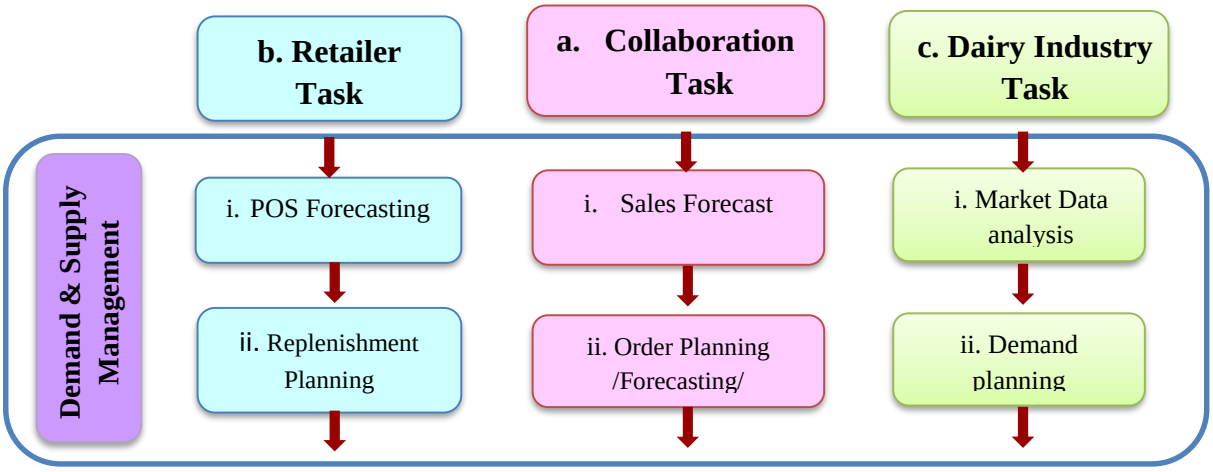


Figure 5.6 CPFR Model Demand & Supply Management Phase

a. Collaboration Task on Demand & Supply Management Phase

In this collaborative task of the model, the dairy processing industry projects demand at the point of sale and determine future product order & delivery requirements. The major collaborative tasks to be done are sales forecasting and order planning /forecasting/.

i. Sales Forecasting

A sales forecast is a prediction based on past sales performance and an analysis of expected market conditions. Steps to develop sales forecaster:

1. Analyze the potential effects of the joint business plan on future retail sales
2. Analyze the potential effect of causal factors on future retailer sales based on historical events and the resulting sales impact.
3. Collect and analyses consumption data like point of sale data, warehouse withdrawals, manufacturing consumptions
4. Identify planned events like store opening/closing, promotions or new product introduction
5. Update shared event calendar
6. Gather sales forecast exception resolution data from previous iteration
7. Generate the forecast for a given period with forecasting tools

There are different forecasting techniques, but in this case of collaborative forecasting, the Delphi forecasting technique is the most appropriate sales forecasting technique.

ii. Order Planning / Forecasting /

In these steps the company determines future product order and delivery requirements based upon the sales forecast.

The order forecast relies on point-of-sale (POS) data, causal information, and inventory strategies to generate a specific forecast that supports the shared sales forecast. The order forecast allows the manufacturer to allocate production capacity against demand while minimizing safety stock. Steps to develop sales forecaster:

1. Provide sales forecast
2. Buyer / Retailer/ Provide replenishment plan
3. Seller / dairy processing industry/ Provide demand plan
4. Gather exception resolution data
5. Create order forecast

b. Retailer Task on Demand & Supply Planning phase

In the demand and supply planning phase, the retailer separately should prepare point of sale (POS) forecast data and replenish planning.

i. POS Forecasting

Point-of-Sales (POS) data measures how much product the end-users purchase when and at which outlet (Simon, 2008). Using POS data in a retailer-manufacturer setting helps the dairy industry to understand the demand of its product and to improve its demand forecast. POS data is the counter top orders at retailer stores.

ii. Replenishment Planning

Steps to develop replenishment plan are:

1. Provide point of sale /POS/ data
2. Identify order forecasting impact events
3. Prepare inventory strategy /seasonality/
4. Identify current inventory position on hand, on order & in transit

c. Manufacturer Task on Demand & Supply Management Phase

In the demand and supply management phase, the dairy processing industry prepares analysis for the market data and the demand planning.

i. Market Data Analysis

Is a technique where the business will take all the available information regarding the market and come up with a marketing plan, it also shows how well you have done in the market using the current market techniques. Therefore the dairy processing industries prepare the market analysis in order to identify size of their market both in volume and in value, the various customer segments and buying patterns, the competition, and the economic environment in terms of barriers to entry and regulation.

ii. Demand Planning

Demand Planning is about what the company should do to shape and create demand by using the sales forecast as one of multiple inputs to create a demand plan aligned with financial goals and inventory plans. Improving demand plan accuracy can result in a 15 - 30% increase in end-to-end inventory turns and perfect order fulfillment (Nazia S & Sadia R, 2010).

Phase III. Execution

In this phase the forecast is realized as actual demand for product delivery to the customer, therefore the plan is turned into action and order generation and order fulfillment is accomplished.

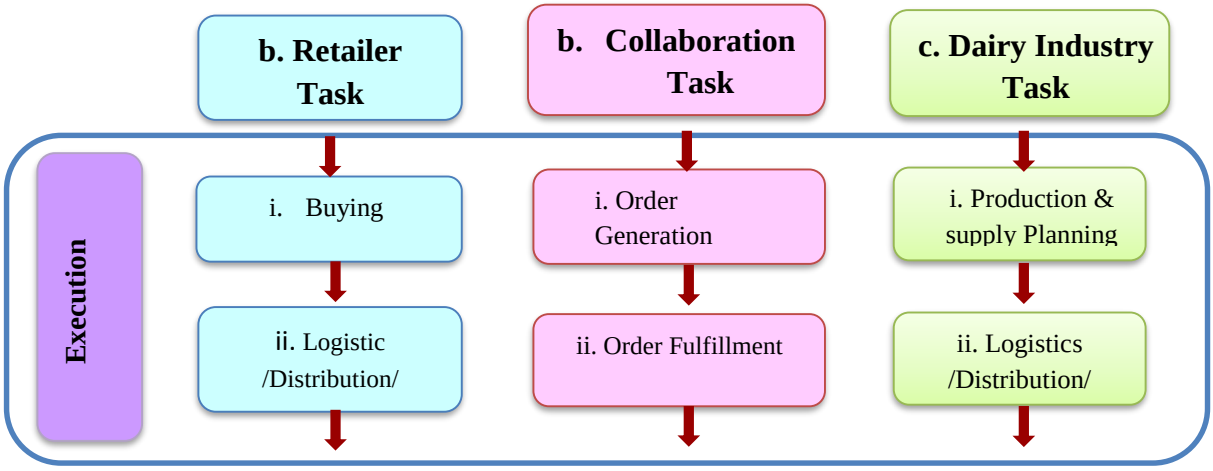


Figure 5.7 CPFR Model Execution Phase

a. Collaboration Task on Execution Phase

The third phase in the CPFR process is generating the order and promising the delivery. The essence of maintaining positive relationships with partners and customers is to deliver on promises

i. Order Generation

This step marks the transformation of the order forecast in to a committed order and the order will done.

ii. Order Fulfillment

A key to effective supply chain management is to meet customer requirements in terms of order fulfillment. Effective order fulfillment requires integration of the firm's manufacturing, logistics and marketing plans. In these stages the generated order produced and fulfilled.

b. Retailer Task on Execution Phase

Buying / Re – Buying & Logistics / Distribution

On this stage the retailer's carries out its buying or re-buying process, as they transfers their buying requests to dairy processing industry. Afterwards, the order is fulfilled while the retailers buy finished products from the dairy processing industry and distributed to the end customer.

c. Manufacturer Task on CPFR Model

In the third phase the dairy processing industry plan supply and the production process in order to fulfill the order.

Production, Supply Planning and Logistics / Distribution

The dairy processing industry planning the material requirement, prepare the production plan and make production based on the plan.

Phase IV. Analysis

Exception Management and Performance Assessment is included in this activity. Monitoring, measurement and continuous improvement of the collaborative planning and execution processes completes this activity.

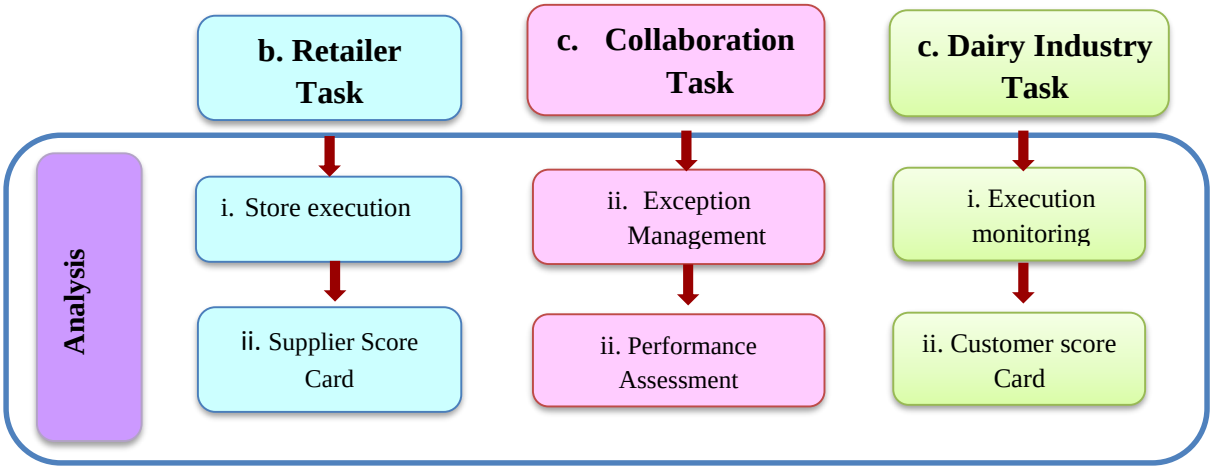


Figure 5.8 CPFR Model Analysis Phase

a. Collaboration Task on Analysis Phase

i. Exception Management

Exception needs to be handled in both sales forecasts and order forecasts. The exception criteria are agreed by the retailer and dairy processing industry in the collaborative agreement. Both parties to identify the exceptions, first retrieve the exception criteria, then identify changes or updates, then compare item values against exception criteria and finally identify exception items. To resolve the exceptions both the retailer and the dairy processers should follow the following steps:

1. Retrieve exception item and decision support data
2. Select desired exception criteria/ value
3. Research exceptions and use the shared event calendar and supporting information to look for the cause
4. Improve collaboration,
5. Summit changes to sales or order forecast.

ii. Performance Assessment / Measurement/

In order to evaluate achievements, uncover trends and create alternative strategies, performance management is used by both, the dairy processing industry and the retailers, together. Therefore, predictions of the dairy processing industry and the retailers will be compared and deviation will be appraised in terms of time, cost and customer satisfaction. Both partners focus on collaborative work and conjointly define solutions in order to optimize critical deviation.

6.2.1 Supplier and Manufacturer collaboration in the Model

Once the manufacturer deal with retailer to plan, forecast and replenish collaboratively, the next step will be identify suppliers and deal with them to work collaboratively for mutual benefit as similar with retailer. Similar with retailers and manufacturer collaboration, in supplier and manufacturer collaboration part, there are four stages: strategy and planning, demand and supply management, execution and analysis are detail explained as below.

Phase I. Strategy and planning

The first collaborative step of the CPFR model defines the rules and basic principles for the collaboration between the dairy processing industry and the supplier. However, before the

collaborative arrangement is taken into consideration, the dairy processing industry must be aware of its strategic planning. After having decided to implement CPFR, the suppliers have to be evaluated and selected.

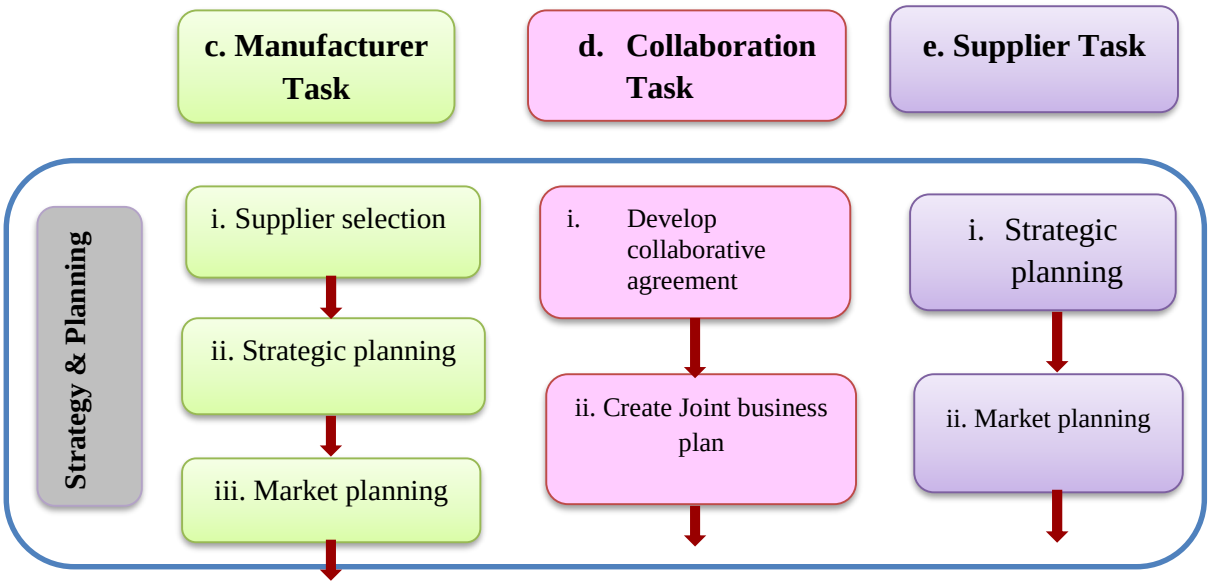


Figure 5.9 Supplier & Dairy Processing Industry CPFR Model Strategy & Planning Phase

c. Manufacturer Task on strategic and planning phase

i. Strategic planning

Before the collaborative arrangement is taken into consideration, the dairy processing industry must be aware of its strategic planning. After having decided to implement CPFR, the suppliers have to be evaluated thoroughly. A significant purchase volume as well as sufficient system capabilities and a trustful relationship are the most important selection criteria. If the supplier's strategic planning agrees on joining a CPFR partnership, a Joint Business Plan is created.

ii. Supplier selection

When the concepts of supply chain management emerged, more and more scholars and practitioners realized that supplier selection and management are vehicles to increase the competitiveness of the entire supply chain (Lee et al., 2001). There are two basic types of problems concerning supplier selection (Ghodsypour and O'Brien, 1998): (1) problems that arise when all suppliers can satisfy the buyers' requirements of demand, quality, delivery, etc.; and (2) problems that arise when there are some limitations in supplier ability or capacity, such as quality or quantity. Therefore Based on different studies (OM Pal, Amit Kumar, Rk Garg, et.)

during supplier selection the manufacturer should consider the following criteria's: competitive price, quality, delivery, performance history, production capacity and geographical location.

iii. Market Data Analysis

The results of separate market planning by the dairy processing industry and the supplier are introduced into the Joint Business Plan.

d. Collaboration Task in strategic and planning phase

In this phase of model development the company develop the ground rules for the collaborative relationships, determine product mix and placement. In this stage the major collaborative tasks are developing collaborative arrangement ant joint business plan.

e. Supplier Task in strategic and planning phase

In this phase the supplier's parallel with their collaborative activity should their strategic plan and market plan. Once the supplier prepares its strategic plan and agrees on joining a CPFR partnership, a Joint Business Plan is created. The results of separate market planning by the dairy processing industry and the supplier are introduced into the joint business plan.

Phase II. Demand and Supply Management

The second collaborative step of the CPFR model is demand and supply management which projects demand at the point of sale and determines future product order & delivery requirements

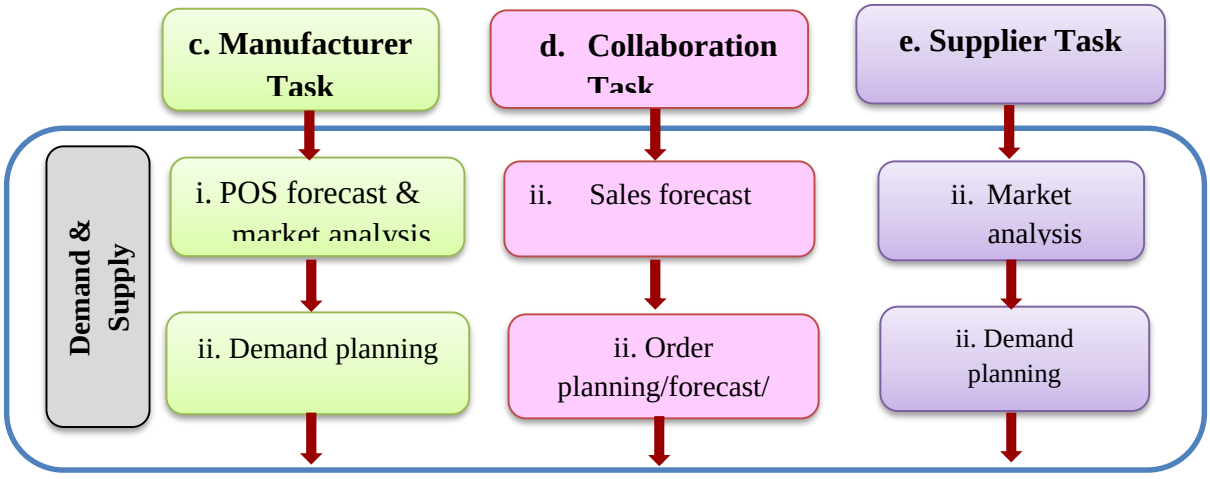


Figure 5.10 Supplier & Dairy Processing Industry CPFR Model demand & supply management Phase

C. Manufacturer Task in demand and supply planning phase

i. POS Forecasting

Point-of-Sales (POS) data measures how much product the end-users purchase (Simon, 2008). Using POS data the dairy industry understand the demand of its product and to improve its demand forecast. POS (Point-of-Sale): Data typically accumulated by retail scanners. Users of these data have up to the minute information on how much of what product was sold when and at which outlet. Therefore, the dairy processing industries collects sales data from its dealers (POS Forecast) and analyzes the market.

ii. Demand Planning

The dairy processing industry after collecting sales data (POS forecast) from its retailers, it analyzes the market and prepares demand planning.

d. Collaborative task in demand and supply planning phase

i. Sales Forecasting

A sales forecast is a prediction based on past sales performance and an analysis of expected market conditions. There are different forecasting techniques, but in this case of collaborative forecasting, like the retailer and manufacturer collaboration, the Delphi forecasting technique is the most appropriate sales forecasting technique.

ii. Order Planning / Forecasting /

In these steps the company determines future product order and delivery requirements based upon the sales forecast. The order forecast relies on point-of-sale (POS) data, causal information, and inventory strategies to generate a specific forecast that supports the shared sales forecast. The order forecast allows the manufacturer to allocate production capacity against demand while minimizing safety stock. Use Similar step of manufacturer and retailer sales forecast development step.

e. Supplier Task in demand and supply planning phase

i. Market Data analysis

The supplier provides a market data analysis and all collected data flow in a conjointly generated Sales Forecast visible for all parties at all times.

ii. Demand Planning

From the collective order plan, the supplier can appraise the required volume of future deliveries.

Phase III. Execution

The third collaborative step of the CPFR model is execution which is the Order Generation and order fulfillment activity done conjointly.

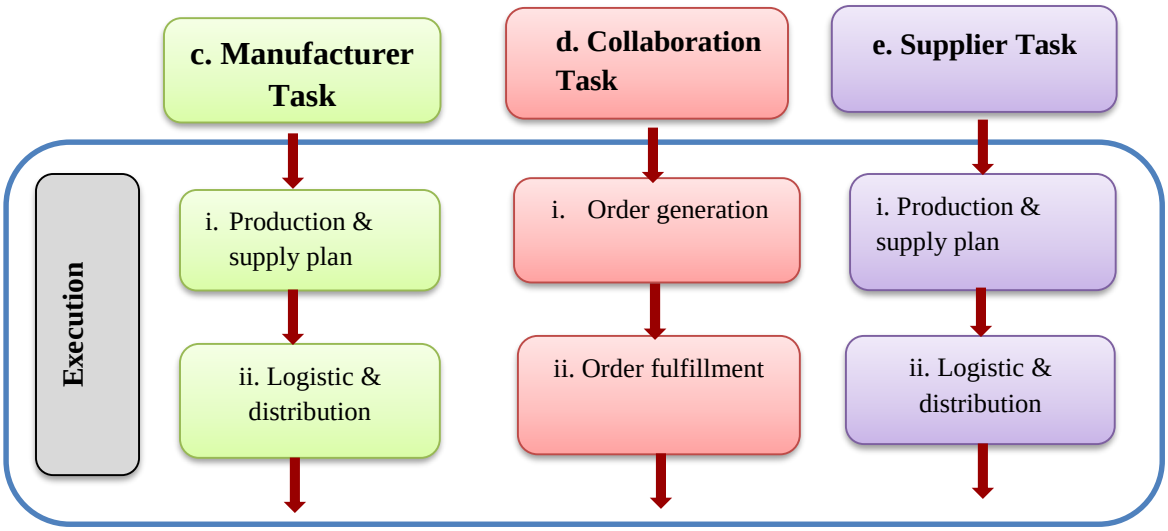


Figure 5.11 Supplier & Dairy Processing Industry CPFR Model Execution Phase

The supplier and the dairy processing industry compile their own production and supply plan. This process is done independently, since both, the supplier and the manufacturer; know best how to optimize their own production line after a common order forecast was done. However, the production and supply planning process is not a singular but a continuous process which is enhanced during the production. Within the same activity, the dairy processing industry carries out its buying or re-buying process, as it transfers its buying requests to their suppliers. Afterwards, the order is fulfilled while the finished products of the dairy processing industry are distributed to the retailer.

Phase IV. Analysis

The final collaborative step of the CPFR model is analysis which contains two collaborative task, exception management and performance assessment. In this stage with the help of execution monitoring, carried out by the dairy processing industry and the supplier separately, an exception management can be achieved together. This means, data from the demand and supply management will be compared with the actual execution.

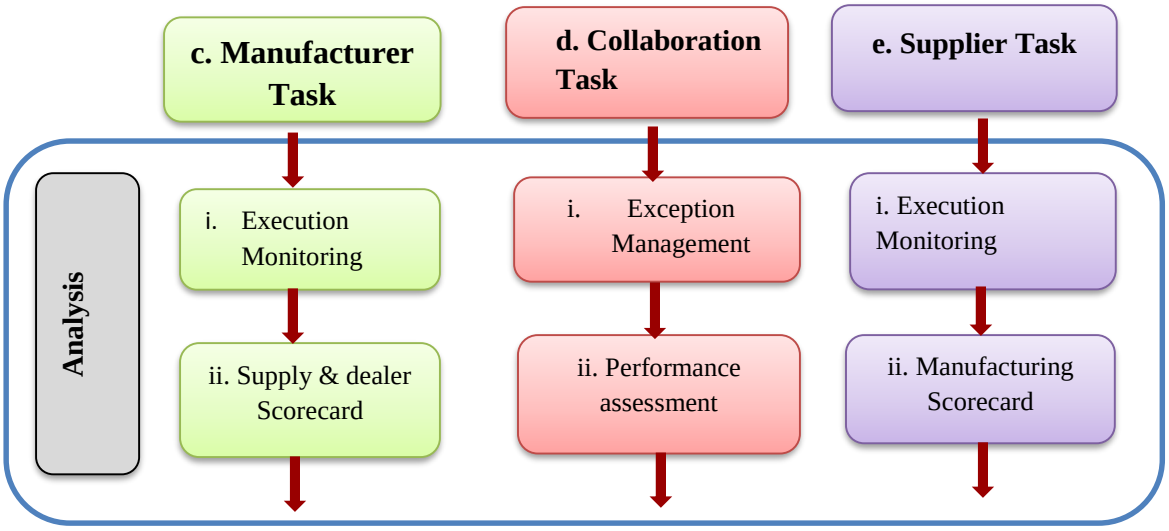


Figure 5.12 Supplier & Dairy Processing Industry CPFR Model Analysis Phase

The dairy processing industry uses supplier scorecards to measure the degree of target achievements. Manufacturer scorecards are used by the supplier and have the same purpose. In order to evaluate achievements, uncover trends and create alternative strategies, performance management is used by both, the dairy processing industry and the supplier, together. Therefore, prediction of the supplier and dairy processing industry will be compared and if deviation will be assessed both partners focus on collaborative work and conjointly define solutions in order to optimize critical deviation.

CHAPTER 6

Application of CPFR Model to a Case Dairy Industry

This chapter presents the application of the model for the case of dairy processing industry which is named as Lame dairy P.L.C.

6.1 Lame Dairy P.L.C

Lame dairy was first established by the imperial regime in 1947 G.C in Addis Ababa, after the donation of 300 dairy cattle from the United Nation Relief and Rehabilitation Administration. During 1960 dairy production in Addis Ababa began to develop rapidly, as a result of the expansion in large private dairy farm, therefore the government established Addis Ababa dairy industry in 1966. Then in 1971 it is changed in to dairy development agency (DDA). In 1979 it was merged with numerous other nationalized dairy farms to establish the dairy development enterprise (DDE). The DDE included large dairy farm milk collection networks and processing plant.

In March 2007, dairy development enterprise (DDE) was privatized and renamed as Lame Dairy PLC and has objective to produce adequate dairy products and supply to the market. Currently Lame Dairy PLC has 300 permanent and temporary employees and has a production capacity of 60,000lt per day.

6.2 Supply Chain of Lame Dairy PLC

Currently lame dairy PLC produces pasteurized milk, yogurt, butter, cheese, creams and ayib. The company mainly collects raw milk in the following ways:

- Collect from individual farmers, cooperatives and unions in its collection center which is located in kuriftu, Koka, Selale, Muketuti, Chancho, Holeta, Debre Brihan, sheno, Sendafa and shola inside the company,
- Collect from 4 individual milk collectors which collect the milk from different area & supply to the company,
- And there are two individual suppliers which have their own dairy farm and supply from their farm.

The company distributes its product to end customer through its sales person, through agent and has three distribution shops which is located in shola inside the factory, piyza and Mexico. The following figure 6.1 shows the supply chain network of Lame Dairy PLC.

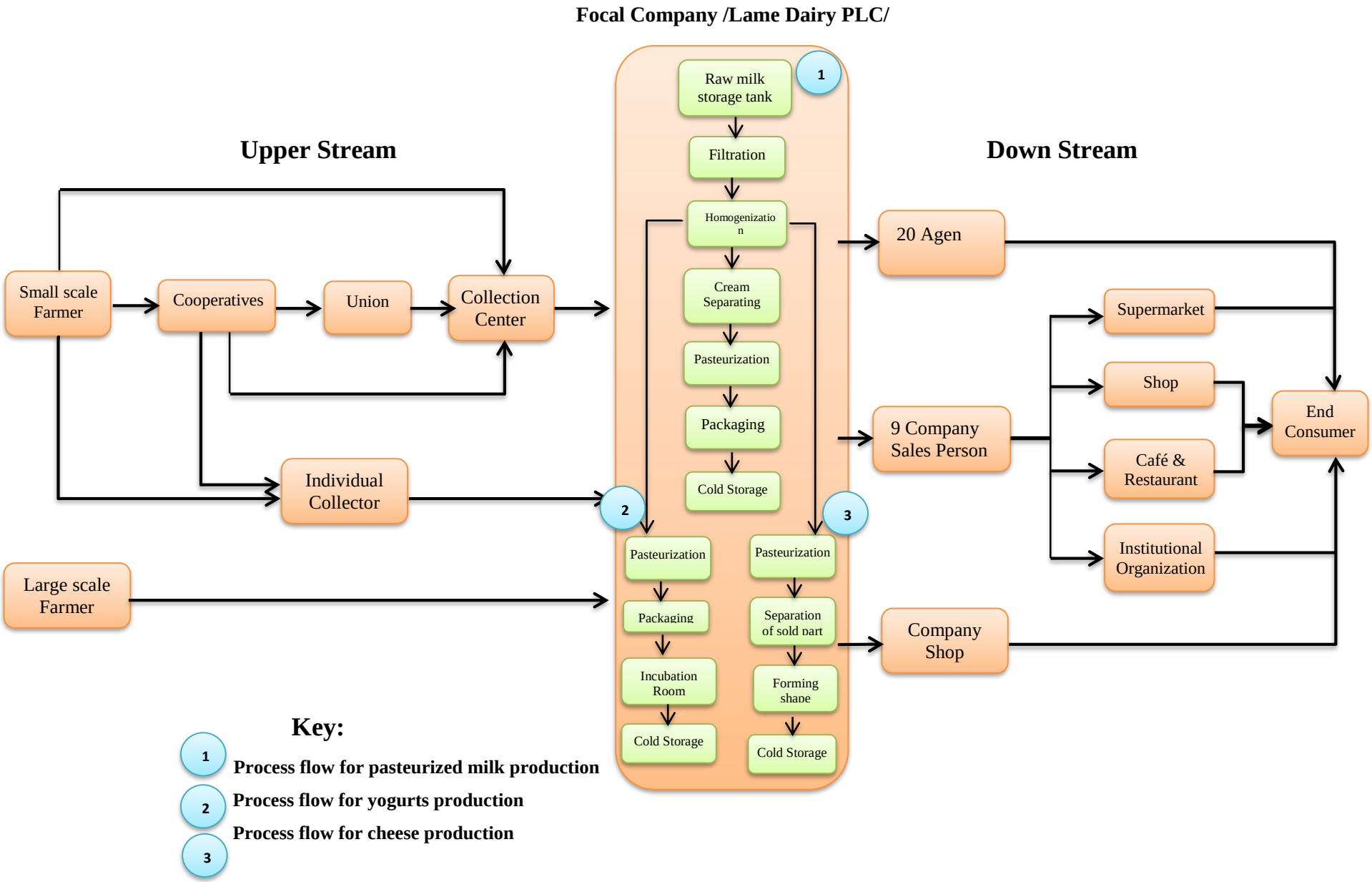


Figure 6.1 Supply Chain Network of Lame Dairy PLC

6.3 CPFR Model Application

The existing practice of Lame Dairy PLC supply chain system and the major challenges which the company are facing due to un collaborated supply chain management system /collaborative planning, collaborative forecasting and collaborative replenishment/ throughout the chain are:

- The supply of raw milk quantity is not constant / it varies daily/ and the daily production capacity of the company depends on the quantity of daily raw milk supplied. Due to this the case company runs below its production capacity and there is always unbalanced supply and demand of milk and milk product.
- There is a Quality problem during milk collection /adulteration/,
- There is also unfair market competition in raw milk purchasing
- Because of Seasonality of the product nature, especially in fasting time some of the produced product may not sold in the market and the sales person return the product to the factory. This happens mainly because of lack of collaborated planning & forecasting practice across the production and distribution chain to end user.

The following figure 6.2 below shows supply chain practices of the case company with its suppliers and retailers. In the chain there is no collaborative activity and all of the actors in the chain are doing separately.

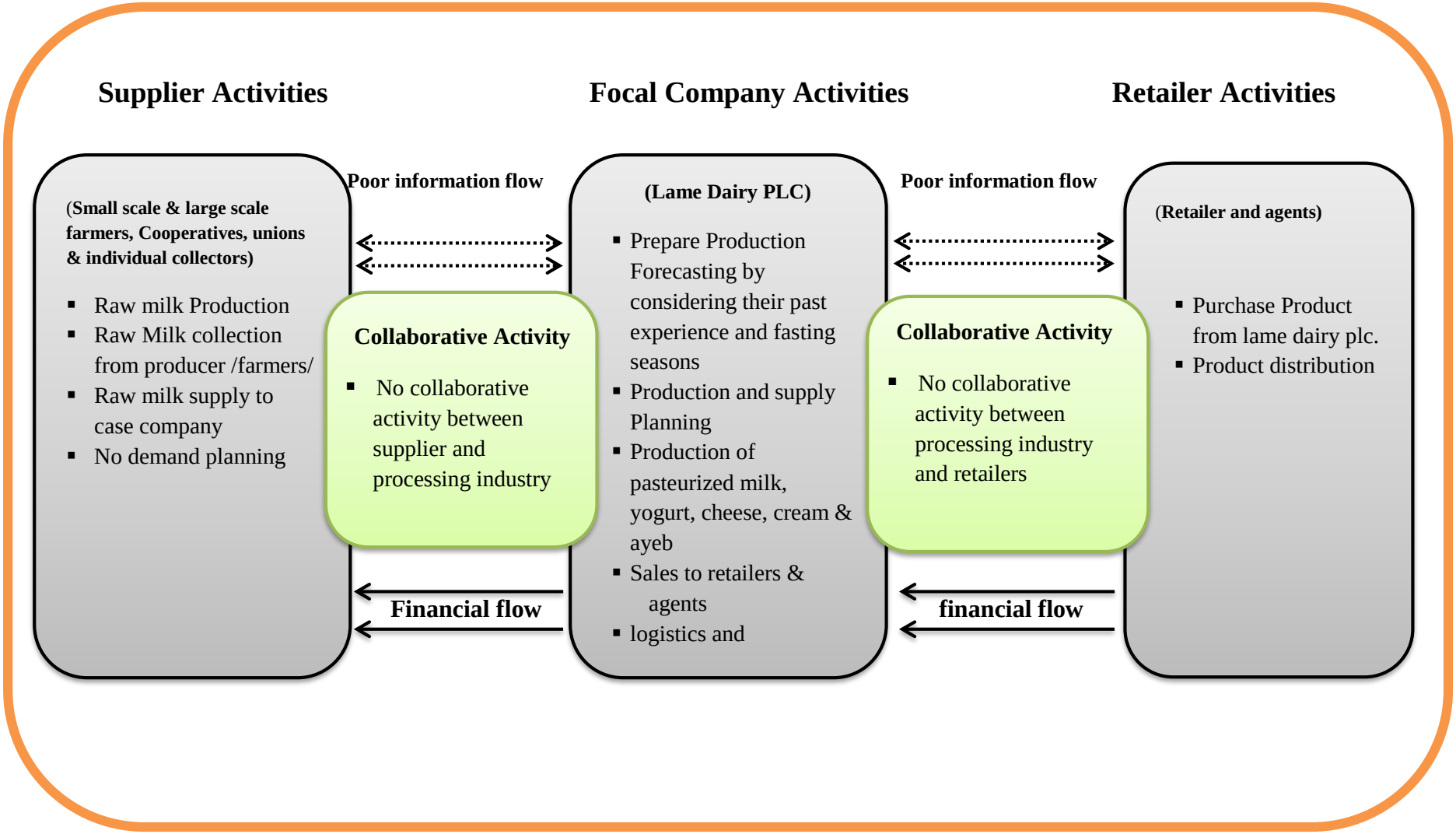


Figure 6.2 Existing supply chain practices of Lame dairy PLC & its Supply & Retailer Collaboration

As it can be seen from fig.6.2, the supply chain members in the lame dairy network perform their respective supply chain in isolation with no indication of collaborative planning, forecasting and replenishment. This in turn impacted their performance. Hence, a CPFR model is used to adders this issue in figure 6.3

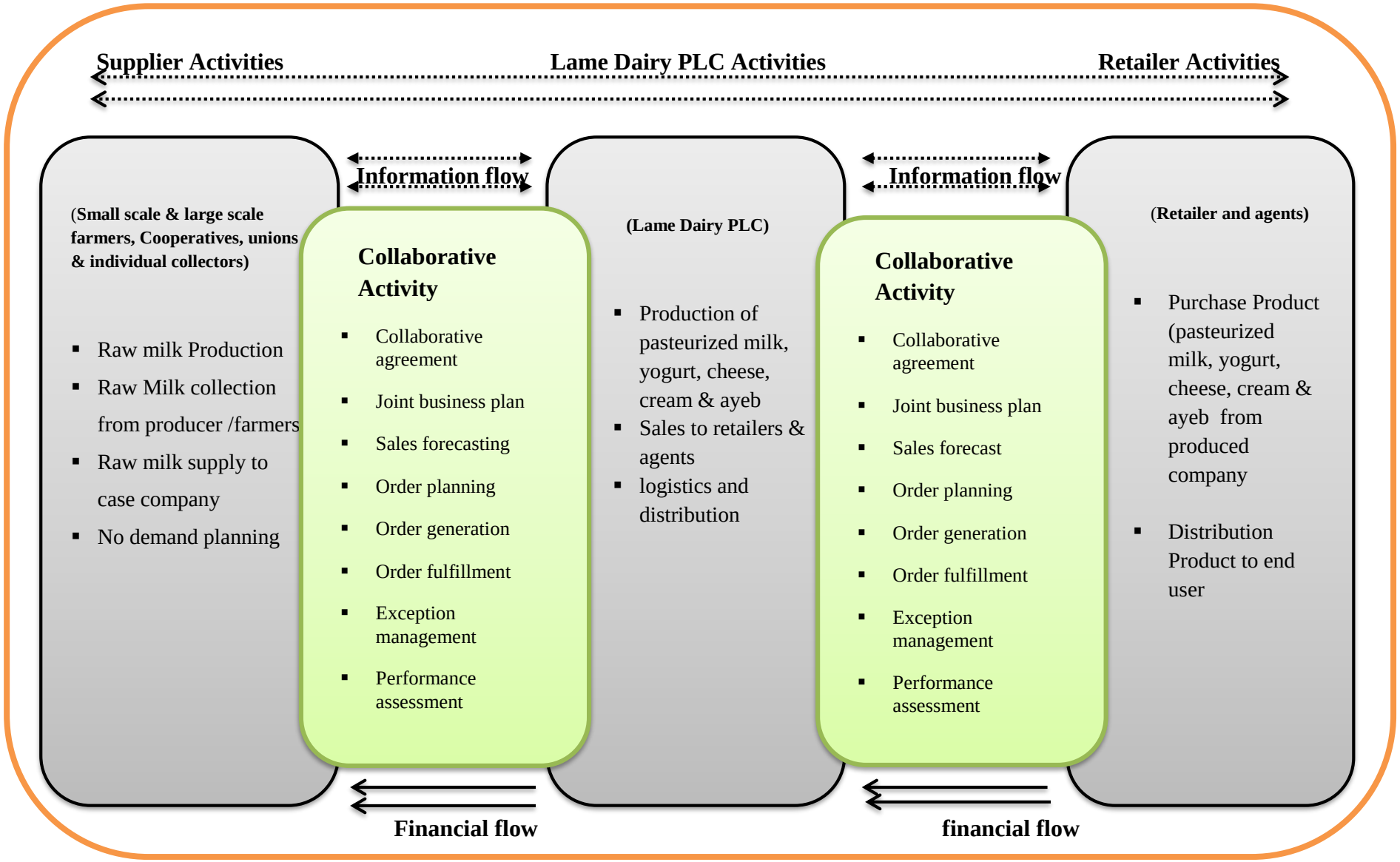


Figure 6.3 collaborative planning, forecasting & replenishment supply chain management for Lame dairy PLC

If the case company implements the proposed CPFR model for its supply chain, enables all the chain to have good information sharing, common objectives, common demand plan and sales forecast. This could adders most of the problems which currently the case company, its supplier and retailers are facing. In addition to this all the actors in the chain share the risk, benefit and everything together which is a base for develop together and satisfy customer requirement.

In general, if the case companies implement CPFR supply chain tools, their supply chain performance will be improved in terms of the following points:

- **Time:** In CPFR supply chain management system; there is a good information flow throughout the chain. In addition to this all the planning, forecasting and replenishment activities are done collaboratively with supplier, producer and retailer, therefore this collaboration makes the time consumption more effective and efficient.
- **Cost:** One of the advantages of using CPFR supply chain management system is in terms of cost minimization. Since most of the activities throughout the chain are prepared and done collaboratively, it can minimize loss and also bull whip effect. Therefore if the company minimizes its cost, it can reduce the selling price of their product than the other competitors company in order to get high market share.
- **Quality:** In CPFR supply chain management system, supplier with manufacturer and manufacturer with retailer deal collaborative agreement for the main requirements of their work. This will enforce all the actors in the chain to maintain the agreed quality and specification of raw material or finished product on the agreement. Therefore the actors in the chain are beneficiary from getting quality raw material and quality finished good supply from each other. In addition to this the end customer will benefit in getting quality product.
- **Customer Satisfaction:** If the company achieved the above listed benefits by implementing CPFR supply chain management system, the company can deliver the right product, at the right place, time, price and right quantity to their customer. This will increase customer satisfaction.

CHAPTER 7

Conclusion and Recommendation

7.1 Conclusion

Even if Ethiopia has the second largest livestock population in Africa, the livestock sector in general and the dairy sector /including dairy industry/ in particular are not developed to the expected level because of many challenges and problems in the sectors. From those problems which hinder the sectors development, poor collaboration and weak information sharing practice throughout the chain takes the major part. On the other hand, in today's competitive market, the competitions between individual enterprises has transformed in to competition between their supply chains which emerged as the biggest differentiating factor between a successful and unsuccessful business. Therefore, the existing poor collaboration & information sharing practice throughout the chain should be improved.

In addition to this, the number of population is rapidly growing and the demand for dairy product in the country is also increasing. Therefore, unless the existing dairy industry improve their performance, it will be difficult for them to meet the demand and customer requirement with their current practice. This will also have impact on the dairy industry efficiency and to stay on the business. This study tries to show the existing poor collaboration and weak information sharing practice throughout chain in twelve sample dairy processing industry on the data analysis part of the study and also for specific case study part in chapter six. So in order to solve the above problem, using one of collaborative supply chain management tools is important.

Therefore the final conclusion is, in order to improve their performance in terms of supply chain collaboration, strong information sharing practice, satisfy their customer needs and to become competent in the market, the dairy processing industry should adopt and implementing collaborative planning, forecasting & replenishment model throughout the chain.

7.2 Recommendation

As stated on the conclusion part, in order to improve the current performance of the dairy industry, they should adopt and implement CPFR supply chain management system. In addition to this, the researcher highly recommends the following points:

- During implementation, the dairy processing industries have to customize the model based on their context and working conditions.
- In addition to implementing CPFR mode, in order to overcome the other problems and challenges, the industry should refer different countries dairy industry practice and benchmarks.
- Like the other sector /e.g. Leather Sector, Garment Sector,…../ the government should give emphasis for this sectors. Because of many reasons the country incurs a lot of dollars per year to import different type of dairy products from abroad.

7.3 Future Research Indication

The following research areas can be directed as an extension of this study for future work.

- This study tried to show, how to improve Ethiopian dairy processing industry supply chain by using CPFR supply chain management tools. But there is a possibility to study other collaboration method and supply chain management tools for the sector.
- This study focused on specific problem of the dairy processing industry and sector. But as mentioned on the different part of the study, there are many other problems and challenges which hinder the sectors development. Therefore there is a possibility to determine and study on those problems of the sector.

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ANNEXES

Annex 1

Addis Ababa University
School of Graduate Studies
Institute of Technology
School of Mechanical and Industrial Engineering

Dear Participants

My name is Roza Fekadu conducting a thesis entitled **"Collaborative Planning, Forecasting and Replenishment Model Development to Enhance Supply Chain Performance, a Case of Dairy Sector"** for partial fulfillment of my M.SC in Industrial Engineering at AAIT, AAU. With sincerity I would like to extend my deep appreciation to your company and the staff for the willingness and cooperation in undertaking this valuable research. I request your kind cooperation in answering the questions as truthfully as possible. Your response will be highly confidential and will not be transferred to other parties for any other purpose.

For other questions pertaining to this study, please feel free to contact my advisors and AAIT, Mechanical and Industrial Department.

Thank you for your valuable information

Contact

RozaFekadu, Mob. 0939 093820 and E-mail: roza.fikadu@yahoo.com
Advisors: Dr. MengistHailemariam

Questionnaire

Optional Information

Age: _____ Academic Qualification:_____

Current position: _____ Service Year:_____

Company profile

1. Name of the company: _____
2. Product type of the company:_____
3. Installed capacity of the company: _____Currently operating capacity: _____
4. Market strategy for the company products, a) Locally ____% b) Export _____%
5. Market share of the company, a) Locally _____% b) Export _____%

Supply chain information

1. Access to the raw material is

   Own made ☐ Purchased ☐ Both ☐
2. Who are the core supplies of your company? Please list them and items they supply.

   _____

   _____
3. Do your company have milk collecting center? Yes ☐ No ☐
4. If yes, how do you manage the collection center? _____

   _____

   _____
5. Where do you locate your milk collecting center and what facilities you carry out?

   _____

   _____
6. How does your company distribute its product to the market?
   a) Through wholesalers and distributers
   b) In your distribution center
   c) If any other please list_____

7. How do you manage your supply chain? (*tick all that apply*)

- ☐ Close partnership with suppliers
- ☐ Close partnership with customers
- ☐ JIT supply
- ☐ e-procurement
- ☐ Outsourcing
- ☐ Subcontracting
- ☐ Few suppliers
- ☐ Many suppliers
- ☐ Holding safety stock
- ☐ Plan strategically
- ☐ Vertical integration
- ☐ Other, please specify_____

8. How much did you actually benefit from managing the supply chain?

	Not at all	Little	Average	Greatly	A lot	Don't Know
Better quality of information						
Better quantity of information						
Flexibility						
Reduced lead-time in production						
Cost saving						
Forecasting						
Resource planning						
Better operational efficiency						
Increased coordination b/n departments						
Increased coordination with suppliers						
Increased coordination with customers						
Increased sales						

9. Rate the following based on your supply chain collaboration practice

	Very Good	Good	Fair	Poor	Very Poor	Don't Know
Information Sharing						
a) Sharing information of manufacturing						
b) Sharing information of processing						
c) Sharing other information with SC members						
Decision Synchronization						
a) Helping to solve operational problems						

b) Making a decision in market planning						
c) Planning to improve and develop product						
d) Planning to improve and develop process						
Collaboration Promoting Factors						
a) Supplier evaluation and audit						
b) Reward high performing suppliers						
c) Reward high performing wholesalers & retailers						
d) Good customer handling Mechanism						

10. Rate the following based on the supply chain performance

	Very Good	Good	Fair	Poor	Very Poor	Don't Know
On time production and delivery						
Responsiveness to fast procurement						
More flexibility to customer need						
Profit increase						

11. What is the company's means of communication with the suppliers and customers?

_____

_____

12. What method of demand forecasting you use? And what was your last 3-5 years actual demand?_____

_____

13. What are your company's distribution obstacles?

_____

_____

14. What are your company's supplier's obstacles?

_____

_____

15. What are the major challenges of your companies supply chain management system?

_____

_____

_____

Thank you again for your cooperation

Annex 2

Annex 2. Respondent Profile

S/N	Company	Age	Sex	Educational Background	Current position
1	Sebeta Agro Industry	54	M	MSC	General Manager
2	Lame Dairy PLC	46	F	BA	Logistic and Supplier Manager
3	M.BC PLC	45	M	BSC	Quality Manager
4	Elemtu Integrated Milk Industry	50	M	MSC	Production Manager
5	Selale Milk Industry	34	M	BSC	General manager
6	Loni agro industry	-	M	-	Quality Head
7	Ada'a Cooperatives	40	M	-	General Manager
8	Holand Dairy PLC	-	M	-	General Manager
9	Genesis Farm	25	F	BSC	Quality Head
10	Worksew Legesse Agro Industry	28	M	BSC	Production Head
11	Timiret Agro Industry	28	M	BSC	Quality Head
12	Tena Milk Processing Factory	30	M	BSC	Production Head

Annex 3. Dairy Processing Companies in Ethiopia

S.No	Dairy Enterprise	Ownership	Location	Year of establishment /E.C/	Capital /in millions/	Business status	Manpower		Annually capacity / in millions liters /		Daily Capacity / liters /		Company Level	Market Strategy
							Perma Nent	Tempo rary	production	Current operational	Productio n	Current operational		
1	Sebeta Agro-industry (Mamma Milk)	Private	Sebeta	1991	8.69	On Production	328	-	14.4	11.9	44,000	16,000	Large	local
2	Lame Dairy Processing /Shoal Milk/	Private	Addis Ababa	2000	-	On Production	235	15	14.05	13.60	60,000	22,000	Large	local
3	Almi fresh milk and milk product processing	Private	Hawassa	1997	13.8	On Production	61	-	10.8	1.616	25,000	7,000	Large	local
4	M.B PLC /Family milk/	Private	Addis Ababa	1999	12	On Production	111	5	7.2	5.7	20,000	15,000	Large	local
5	ElemtuIntegerated Milk Industry Share Company	Share company	Sululta	2007	-	On Production	75	7	5.64	-	-	-	Large	local
6	Ada'a dairy cooperatives	Union	DebreZeit	1999	-	On Production	30	23	5.6	0.8	15,000	2,500	Large	local
7	NuredinHassen Milk Processing Factory	Private	-	2006	8.0	On Production	13	-	5.55	-	-	-	Large	local
8	Holand Dairy PLC	Private	DebreZeit	1995	4.275	On Production	32	43	5.4	3.5	15,000	10,000	Medium	local
9	WorksewLegesseEshetie Agro Industry /Etete Milk/	Private	Beke	2006	42	On Production	125	25	5.25	-	40,000	5,000	Medium	local
10	Loni agro industry PLC	Private	-	2005	-	On Production		-	3.6	1.6	10,000	5,000	Medium	local

11	Life Agro Industry	Private	-	2002	-	On Production	-	-	3.6	-	10,000	3,000	Medium	local
12	Borowaqo Milk Processing Factory	Private	-	2006	26	On Production	42	-	3.6	-	10,000	1,000	Medium	Local, Djibouti and Somali Land
13	Ruth and hirut milk processing /Tsega milk/	Private	Addis Ababa	2005	12.5	On Production	44	20	2.355	1.8	6,000	5,000	Medium	local
14	Yakila Milk and Milk Product Processing Enterprise	Private	-	2003	2.3	On Production	22	9	2.16	1.04	4,000	2,000	Small	local
15	Chuye Milk and Milk Product Processing Enterprise	Private	-	2004	1.5	On Production	3	10	0.72	0.416	2,000	500	Small	local
16	Awash Melkassa Agro Industry PLC	Private	Adama	2007	2.76	On Production	30	5	1.8	-	4,000	1,000	Small	local
17	TsehayReta Milk Processing Enterprise	Private	-	2005	-	On Production	-	-	0.36	-	4,000	200	Small	local
18	Timret Agro – Industry Share Company	Share company	-	2004	-	On Production	35	5	-	0.168	1,500	1,000	Small	local
19	TigrayMulti PurposeMarketing Cooperative Union	Union	Tigray	-	-	On Production	-	-	-	-	5,000	200	Small	local
20	Jantekel Milk	Private	Gonder		0.67	On	12	-	0.36	-	1,000	500	Small	local

	Development and Marketing Cooperative Union (Fasil Milk)					Production								
21	Emenet and lijocha milk & milk product processing PLC	Private	-	2004	-	On Production	10	10	0.36	-	-	-	-	local
22	Dire Dawa Dairy Processing Enterprise	-	Dire Dawa	1965	-	-	-	-	-	-	20,000	20,000		local
23	Zemen Milk	-	Mekele	-	-	-	-	-	-	-	2,000	150		local
24	Kokeb milk production cooperative union	Union	-	-	1	On Production	8	-	-	-	-	-	-	local
25	Selale Cooperative Union	Union	Selale	2007	12	In Progress	27	4	-	-	20,000	-		local
26	Gebarwels agro industry	Private	-	-	-	Under Constriction	-	-	1.935	-	-	-	-	local
27	One to One International Business /Lina Milk/	Private	-	2006	-	Under Constriction	-	-	1.08	-	-	-	-	local
28	HiwotBirhan Cooperative Union	Union	-	2000	-	Under Constriction	-	-	0.54	-	-	-	-	local
29	Kombolicha Dairy Farm Cooperative Union	Union	-	-	-	Under Constriction	-	-	-	-	-	-	-	local
30	Selale Dairy Development	Private	-	-	-	Under Constriction	-	-	-	-	-	-	-	local

	PLC													
31	Helen Agro Industry	Private	-	-	-	Under Constriction	-	-	-	-	-	-	-	local
32	Taddese Milk Processing Enterprise	Private	-		8	Under Constriction	-	-	-	-	-	-	-	Local
33	MichealAbriha Milk Processing Enterprise	Private	-		8.76	Under Constriction	4	-	-	-	-	-	-	local
34	MisganaTesfaye Milk Processing Enterprise	Private	-		12	Under Constriction	-	-	-	-	-	-	-	Local